PB90-178039

Superfund Record of Decision (EPA Region 6): Motco Superfund Site La Marque, Texas (Second Remedial Action), September 1989

(U.S.) Environmental Protection Agency, Washington, DC

27 Sep 89

U.S. Department of Commerce
National Technical Information Service
NTIS

United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R06-89/052
September 1989

PB90-178039

EPA

Superfund Record of Decision:

MOTCO, TX

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15. Supplementary Notes

16. Abstract (Limit: 200 words)

The 11-acre Motco site is in La Marque, Galveston County, Texas. The site is on the Gulf Coastal Plain at edge of a coastal marsh system and is within the 100-year tidal floodplain. Significant site features include seven unlined pits which have a total surface area of 4.6 acres and contain surface water, organic liquids, and various sludges, tars, and other solids. The pits were used by a styrene tar recycling business which operated from 1959 to 1961, and by an industrial chemical waste disposal facility from 1961 to 1968. EPA conducted three emergency response actions between 1981 to 1983 to treat and discharge excess pit surface water collected in dikes that were constructed by the Coast Guard in 1980. In 1984 an initial remedial measure (IRM) was conducted by EPA and included removal and offsite disposal of wastes from nine above ground storage tanks. The first operable unit for the site was issued in 1985 and dealt with source control measures including excavation of the onsite waste pits, which contained 12 million gallons of contaminated water and organic liquids, down to the sludge/soil interface plus one foot, and incineration of those wastes. This Record of Decision represents the second and final operable unit, management of migration, for the site and addresses the subsurface beneath the waste pits and offsite contamination of the ground water, soil, and sediment. Ground water at the site is found in a Transmissive Zone and the underlying Upper Chicot aquifer. The primary contaminants of concern affecting the soil, sediment, and ground water are VOCs including benzene; (Continued on next page)

17. Document Analysis a. Descriptors
Record of Decision - MOTCO, TX
Second Remedial Action - Final
Contaminated Media: soil, sediment, gw
Key Contaminants: VOCs (benzene), other organics (PAHs), metals (arsenic, chromium, lead)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement

19. Security Class (This Report)
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21. No. of Pages
118

20. Security Class (This Page)
None

22. Price
A06

(See ANSI-Z39.18)

See Instructions on Reverse

OPTIONAL FORM 272 (4-77)
(Formerly NTIS-35)
Department of Commerce

16. Abstract (Continued)

other organics including PAHs; and metals including arsenic, chromium, and lead

The selected remedial action for the site includes extraction and onsite treatment by best available technology (BAT) of contaminated shallow and deep ground water; extraction and incineration of approximately 1 to 2 million gallons of dense, non-aqueous phase organic liquids; installation of a ground water gradient to impede further contaminant migration from shallow to deep ground water; implementation of ground water compliance monitoring of the shallow and deep ground water aquifers which would trigger more aggressive removal operations if indicator compounds exceed one-half MCL or a 10-6 risk level; excavation, consolidation and onsite containment and capping of approximately 140,000 cubic yards of contaminated surface soil and sediment to a maximum depth of four feet; and implementation of deed restrictions and installation of additional fences around the site. The estimated total present worth cost for the selected remedy is $8,810,000, which includes an annual O&M cost of $453,000.

PORTIONS OF THIS REPORT ARE NOT FULLY LEGIBLE DUE TO THE HISTORICAL NATURE OF SOME OF THE MATERIAL. HOWEVER, IT IS THE BEST REPRODUCTION AVAILABLE FROM THE COPY SENT TO NTIS.

RECORD OF DECISION

FOR

MOTCO SUPERFUND SITE

LA MARQUE, TEXAS

MANAGEMENT OF MIGRATION OPERABLE UNIT

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

SEPTEMBER 1989

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

MOTCO
La Marque, Texas

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the second operable unit, Management of Migration (MOM) portion of the MOTCO Superfund site, in La Marque, Texas, chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practical, the National Oil and Hazardous Substance Pollution Contingency Plan, 40 CFR Part 300, November 20, 1985. This decision document explains the factual and legal basis for selecting the remedy, and is based on the administrative record for this site. The index found in Appendix A identifies the items which comprise the administrative record for the second operable unit.

The State of Texas (through the Texas Water Commission) has been provided an opportunity to comment on the technology and degree of treatment proposed by the Record of Decision. The letter describing the State's concurrence with the selected remedy is found in Appendix B.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision, may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE REMEDY

The MOM Operable Unit is the final of two operable units for the site. The first operable unit at the site involved the remediation of the wastes pits. The Record of Decision for the Source Control was issued in March, 1985. The Source Control Operable Unit dealt with the excavation of the existing onsite waste pits to the sludge/soil interface plus one foot and incineration of those wastes. Incineration was chosen as the Source Control remedy, which is currently under design and construction. This second operable unit addresses the subsurface beneath the pits and offsite contamination of the ground water, subsurface soils, surface soils and sediments.

The major components of the selected remedy include:

1. Extraction and treatment of contaminated shallow and deep ground water. The deep zone shall be treated to MCL's or appropriate levels to maintain 1×10^{-6} risk levels. (1×10^{-6} risk level is the potential for one person in a million to develop cancer through exposure to contaminants.)

2. extraction, to the extent feasible, and incineration of dense, non-aqueous phase organic liquids;

3. excavation, consolidation and onsite containment of contaminated surface soils and sediments to a maximum depth of four feet. Vertical and lateral extent of excavation shall be determined by 1×10^{-6} risk levels.

4. installation of a ground water gradient control system to create upward ground water gradients to impede further contaminant migration from the shallow ground water to the deep ground water;

5. implementation of ground water compliance monitoring of the shallow and deep ground water aquifers. In addition, the monitoring of the clay layer between the shallow and deep ground water aquifers shall be performed to detect any contaminants that may migrate to the deep aquifer. In the event that contaminants are detected in the clay layer (one-half of the MCL or appropriate health-based number), a more aggressive extraction program shall be implemented in the shallow ground water zone;

6. contaminated ground water that is extracted for treatment will be treated by the best available technology (BAT) to the applicable, or relevant and appropriate State or Federal discharge standard, or sent to a permitted wastewater treatment plant; and

7. implementation of deed restrictions to prohibit land development and installation of additional fencing around the site. To implement these controls, the potentially responsible parties (PRP's) have purchased additional land adjacent to the site. At a minimum, as a part of the annual monitoring and maintenance of the site, there will be a verification that site conditions have not chanaged and that there has been no land use or development that may effect the remedial action. If any changes occur, the Environmental Protection Agency (EPA) will evaluate the changes and take appropriate action.

EPA has the enforcement authority to insure that no one interferes with the remedial action, including land use and interference or damage to the final cap and ground water monitoring. If site conditions change, the changes will be evaluated and appropriate aciton taken.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practical and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because this remedy may result in hazardous substances remaining onsite above health-based levels, a review will be conducted within five years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

Robert E. Layton

Robert E. Layton Jr., P.E.,
Regional Administrator

Sept. 27, 1989

Date

MOTCO SUPERFUND SITE

LA MARQUE, TEXAS

MANAGEMENT OF MIGRATION
SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

SEPTEMBER, 1989

MOTCO SUPERFUND SITE

LA MARQUE, TEXAS

MANAGEMENT OF MIGRATION
DECLARATION FOR THE RECORD OF DECISION

SEPTEMBER, 1989

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I. SITE LOCATION AND DESCRIPTION

The MOTCO site, located about 2 miles southeast of the City of La Marque, Galveston County, Texas, is situated on an 11.3 acre tract of land near the junction of State Highway 3 and the Gulf Freeway (I-45/US-75). The site is bounded on the east by State Highway 3, on the northwest by an abandoned trailer park, and on the southwest by the right-of-way (R.O.W.) for Houston Lighting and Power transmission lines (H.L.& P. R.O.W.) (Figures 1 and 2).

The MOTCO site sits on the Gulf Coastal Plain at the edge of a coastal marsh system, and area topography slopes gently toward the Gulf of Mexico. At approximately +5 feet mean sea level (MSL) elevation, the site is well within the 100-year tidal floodplain of +12 feet MSL and is subject to inundation. Seven waste pits are surrounded by an exterior dike which collects precipitation. Site security is provided by a 6-foot chain link fence, and site access is through locked gates.

In addition to site boundaries mentioned above, pertinent features in the vicinity of the site include:

1. Water-filled borrow pits approximately 150 feet southwest of the H.L. & P. right-of-way (R.O.W.);
2. Central Freight Lines (truck terminal) and Dispos-All Company (currently vacant) yard approximately 500 feet to the southeast;
3. Gulf Freeway (I-45/US 75) approximately 1000 feet to the west-southwest;
4. Omega Bay Subdivision approximately 1500 feet west-southwest;
5. Bayou Vista Subdivision approximately 1500 to 2000 feet south-southwest; and
6. private residence approximately 2000 feet northwest.

Approximately 3000 people live within a 1-mile radius of the site, and about 12,000 people live within a 3-mile radius.

The uppermost geologic unit beneath the site is the Beaumont Clay Formation composed of 800 to 1000+ feet of interbedded clay, sand, and silt deposits.

Predominant near-surface geologic units are two channel sand/silt deposits at about 5-10 feet deep and 20-30 feet deep, and an additional bar finger deposit at about 40-50 feet deep. These layers are separated by clayey

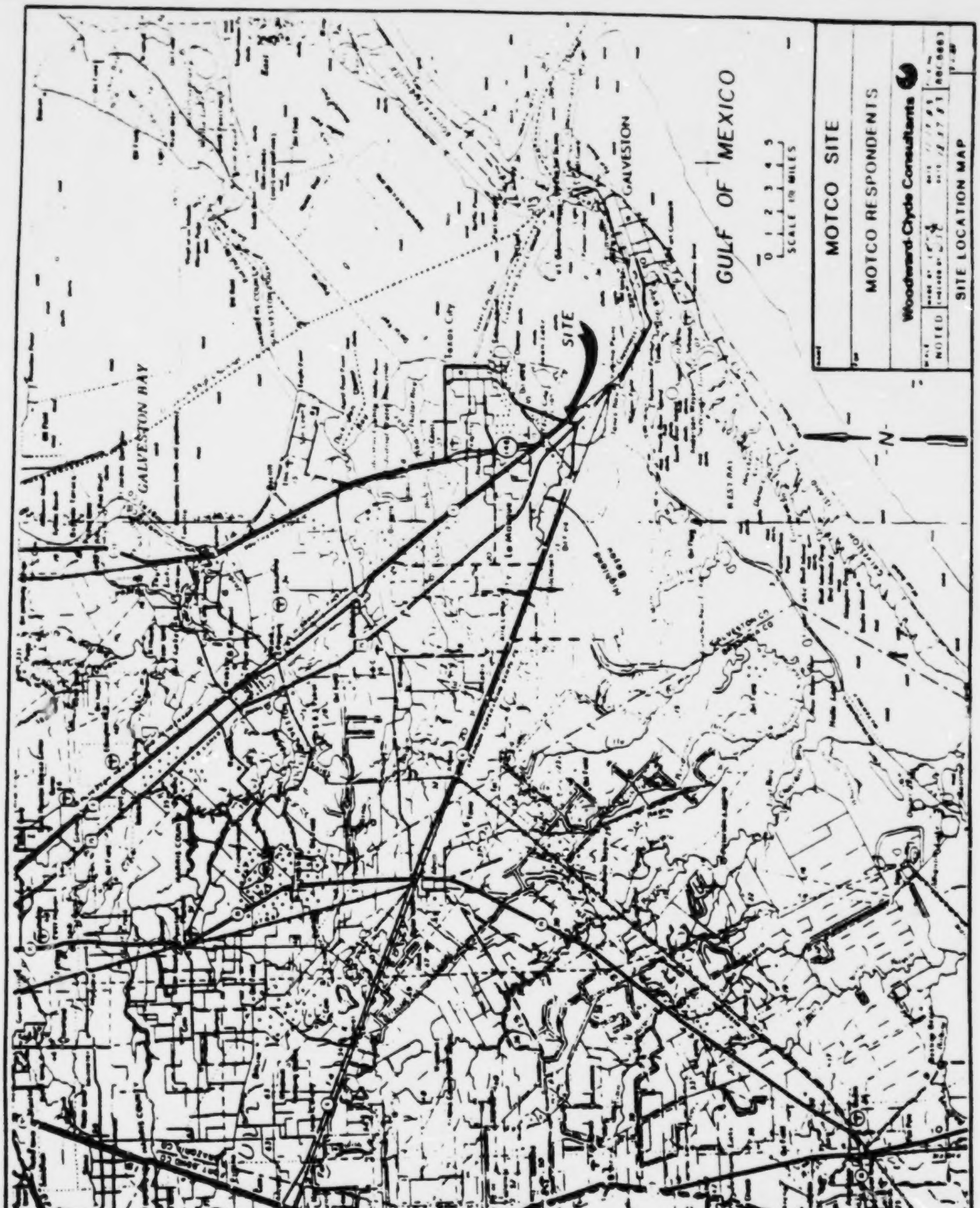
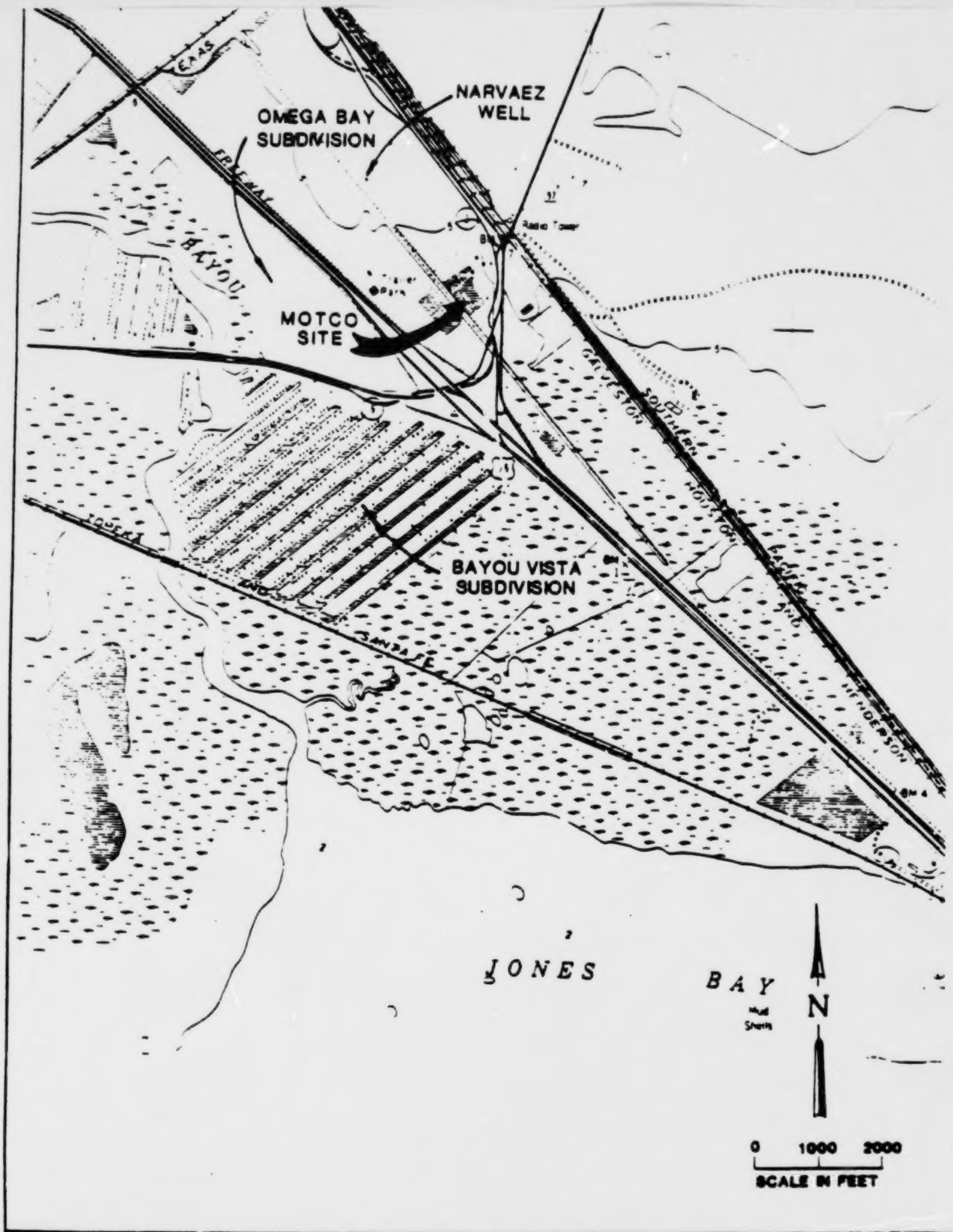

MOTCO SITE
MOTCO RESPONDENTS
Woodward-Clyde Consultants
SITE LOCATION MAP
GULF OF MEXICO
GALVESTON
GALVESTON BAY
SITE
0 1 2 3 4 5
SCALE IN MILES
N

Figure 1

Reproduced from
best available copy.


NARVAEZ
WELL
OMEGA BAY
SUBDIVISION
FREEWAY
BAYOU
Radio Tower
MOTCO
SITE
GALVESTON
SOUTHERN
HOUSTON
PACIFIC
AND
HENDERSON
BAYOU VISTA
SUBDIVISION
TOPEKA
AND
SANTA FE
JONES
BAY
Mud
Shells
N
0
1000
2000
SCALE IN FEET

NAME MOTCO SITE	Woodward-Clyde Consultants	SITE LOCATION MAP	FILE NO 88C8463
FOR MOTCO RESPONDENTS	SCALE NOTED	MADE BY DATE 5-16-88 CHECKED BY DATE	FIGURE

Figure 2

Reproduced from
best available copy.

SYSTEM	SERIES	FORMATION		HYDROLOGIC UNIT (Harris/ Galveston County)	HYDROLOGIC UNIT (Gulf Coast Area)	
Quaternary	Holocene	Alluvium		Beaumont	Upper Chicot	Chicot Aquifer
	Pleistocene	Beaumont Clay				
		Lissie Formation	Montgomery Formation	Alta Loma Sand	Lower Chicot	
			Bentley Formation			
			Willis Sand			
Tertiary	Pliocene	Goliad Sand		Heavily pumped layer	Evangeline Aquifer	

After: Texas Water Commission, 1985
Report 289

NAME MOTCO SITE	Woodward-Clyde Consultants	GEOLOGIC AND HYDROLOGIC UNITS	FILE NO. 86C5653
FOR MOTCO RESPONDENTS	SCALE NOTED MADE BY RWS DATE 10-24-88 CHECKED BY jmk DATE 10/24/88		FIGURE

Figure 3

silts and silty clays, and the upper two sand/silt deposits apparently intersect with the unlined pits.

Underlying the shallow transmissive zones mentioned above, are the Upper Chicot units UC-1, UC-2, and UC-3. The exact depths and thicknesses of these units vary across the site. However, the average depth for the Upper Chicot 1 is generally -90 to -105 feet MSL, Upper Chicot 2 is -150 to -210 feet MSL, and Upper Chicot 3 is below -230 feet MSL.

The seven unlined pits onsite vary in depth from 15 to 20 feet and have a total surface area of 4.6 acres. The pits contain several strata including surface water; organic liquids; and various sludges, tars, and other solids. Waste constituents include polymeric (primarily styrene) tars, chlorinated hydrocarbons, spent catalysts, and other chemicals (Figure 4).

2. SITE HISTORY AND ENFORCEMENT ACTIVITIES

The MOTCO site was purchased by U.T. Alexander in 1959 for the purpose of recycling styrene tars generated by local industry. In 1961, damage from Hurricane Carla caused discontinuation of the recycling business. The pits on the site were then used for disposal of industrial chemical wastes. In 1963, Alexander transferred ownership of the site to Petro Processors, Incorporated, a Texas corporation, of which U.T. Alexander was president. In 1964, the site was permitted as a disposal facility by the State of Texas and it continued to operate until 1968. In 1968, due to numerous odor complaints, the City of La Marque, in which the site is located, passed an ordinance prohibiting disposal of liquid wastes in surface impoundments which effectively forced Petro Processors out of business. In 1969, the Mainland Bank foreclosed on the site.

Through a series of subsequent owners who did not operate the site, (including J.W. Yeatman and Associates and Wye Development Corporation), it eventually became the property of T. Holman, J.R. McDonald, and MOTCO, Inc., a Minnesota corporation. These owners unsuccessfully attempted to recycle the wastes in the pits and then abandoned the project. At some point in time during the recycling attempts, MOTCO bought Holman's and McDonald's interest in the site. In 1976, the Texas Department of Water Resources (TDWR), now known as the Texas Water Commission (TWC), cancelled MOTCO's permit by means of an Administrative Order and required a closure plan. Shortly thereafter, MOTCO filed for bankruptcy and the trustee abandoned the site as a worthless asset. In 1977, MOTCO, Inc. forfeited its right to do business in the State of Texas, but remained an active corporation on the Minnesota Secretary of State's records. Attempts to contact MOTCO, Inc., or its agents have been unsuccessful.

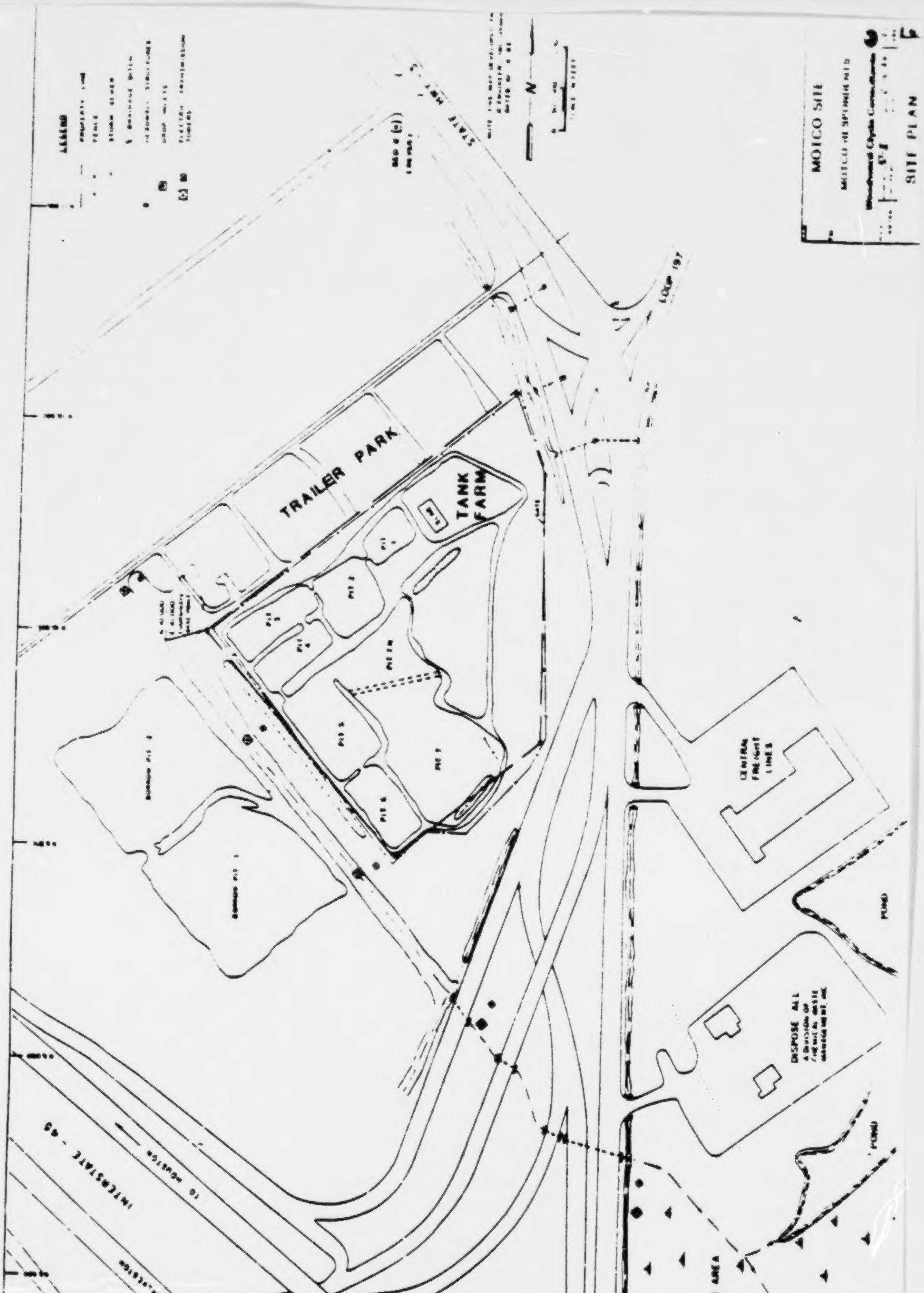

MOTCO SITE
SITE PLAN
Woodward-Clyde Consultants
LEGEND
N
STATE HWY 3
LOOP 197
TRAILER PARK
TANK FARM
CENTRAL FREIGHT LINES
POND
DISPOSE ALL
A DIVISION OF CHEMICAL WASTE MANAGEMENT INC
MARSH AREA
POND
INTERSTATE - 45
TO HOUSTON
TO GALVESTON

Figure 4

From May to September 1980, the U.S. Coast Guard (USCG), with recommendations and technical assistance from EPA and TDWR, used Clean Water Act Section 311 funds to remove drums that had been stored in and around an abandoned service station building, extend and raise the perimeter dikes, and secure the site by erecting a 6-foot fence around the perimeter of the site.

In February 1981, the Response Action Plan for the MOTCO Site was issued by the Environmental Protection Agency (EPA). From 1981 to 1982, an Initial Site Investigation (including Tankage Waste Inventory) and a Secondary Site Investigation was completed. These efforts included characterization of pit wastes; analysis of surface soils, sediments, and waters; and a ground water monitoring program. Contamination of the shallow ground water was confirmed, but the areal and vertical extent and degree of contaminant migration were not determined.

The EPA has conducted three emergency response actions (September 1981; March 1983; and September 1983) to treat and discharge excess pit surface water collected in the extended and upgraded dikes constructed by the USCG in 1980. These actions were conducted following periods of heavy rainfall and/or storm surges to reduce the potential for release of contaminants from dike overtopping.

In July, 1982, EPA Region 6 ranked the MOTCO site using the Mitre Model for inclusion on the National Priority List of Superfund sites. A hazard ranking of 62.5, the highest ranking of any site in Texas, was assigned.

In early 1983, EPA completed the Remedial Action Master Plan (RAMP) and a Source-Control Feasibility Study. Based on a detailed assessment of available data and information in the RAMP, specific additional data requirements were identified, and a specialized sampling/analysis program was conducted September to November, 1983.

In early 1984, an Initial Remedial Measure (IRM) was conducted by EPA. This IRM included removal and off-site disposal of wastes in the nine above-ground tanks, and demolition/ removal of those tanks. In accordance with the National Contingency Plan (NCP), Section 300.68, the EPA determined in late 1984 that off-site remedial actions would be necessary at the site. To this end, an additional investigation was begun in the summer of 1987.

In order to expedite the onsite waste pit remediation, the site was divided into two operable units, Source Control and Management of Migration (MOM). The Record of Decision for the Source Control Unit was issued on

March 15, 1985, selecting incineration as the EPA's preferred remedial alternative. A Consent Decree for the Source Control Unit was then negotiated and signed by 21 companies, the MOTCO Trust group, in early 1987 to conduct the incineration remedy. The onsite incinerator is currently being constructed at the MOTCO site.

In 1986, special notice letters were sent to the MOTCO respondents for the off-site Remedial Invsetigation activities. The MOTCO Trust Group entered into an Administrative Order on Consent in April of 1987 to conduct the off-site and ground water investigation. The Supplemental Feasibility Study Investigation (SFSI), Endangerment Assessement, and Feasibility Study were submitted to EPA in early 1989.

3. HIGHLIGHTS OF COMMUNITY PARTICIPATION

As required by CERCLA section 113(K)(2)(B)(i-v), the Agency conducted a number of public participation activities designed to provide citizens with an opportunity to receive information about and comment on the Supplemental Investigation and Feasibility Study for the MOTCO Superfund Site in La Marque, Texas.

An administrative record has been maintained at 10 locations, the addresses of which can be found in the Administrative Record.

The Supplemental Investigation and Feasibility Study for the MOM Operable Unit were released to the public in April 1989 and July 1989 respectively. These two documents were made available to the public in the Administrative Record and at the information repositories listed in the Responsiveness Summary (Appendix C) of this document. A fact sheet that outlined the results of the Supplemental Investigation and the status of both of the site's operable units, was distributed to the public in April 1989. A news release and a second fact sheet that provided details of the Feasibility Study and the remedial alternatives were released in July 1989.

A public comment period was held from August 7, 1989, until September 5, 1989, and a public meeting was conducted August 23, 1989. At this meeting, officials from EPA described the remedial alternatives under consideration to address the migration of contaminants off the MOTCO site, and answered questions from members of the public about the site. A summary of the Agency's responses to the comments received during the public comment period and at the public meeting is included in the Responsiveness Summary, which is a part of this Record of Decision (Appendix C).

A local citizens group sent EPA a letter of intent requesting a Technical Assistance Grant (TAG) on November 1, 1988. This MOTCO citizens group has requested the application forms; However, to date, the group has not been able to become formally organized.

A local citizen has requested that the TAG monies be spent on base-line health studies. This request is outside of the scope of the TAG Federal regulations that govern the expenditure of all TAG grants. The local citizens have been encouraged to work with the local State, and county health departments concerning base-line health studies.

This Record of Decision presents the selected remedy for the Management of Migration operable unit of the MOTCO Superfund Site in La Marque, Texas. The remedy has been chosen in accordance with CERCLA, as amended by SARA, and to the extent possible by the National Contingency Plan. The Administsrative Record is the basis for this decision.

4. SCOPE AND ROLE OF OPERABLE UNIT

As with many Superfund sites, the environmental concerns at the MOTCO Site are complex. As a result, the EPA organized the work into two operable units (OU's). These OU's are:

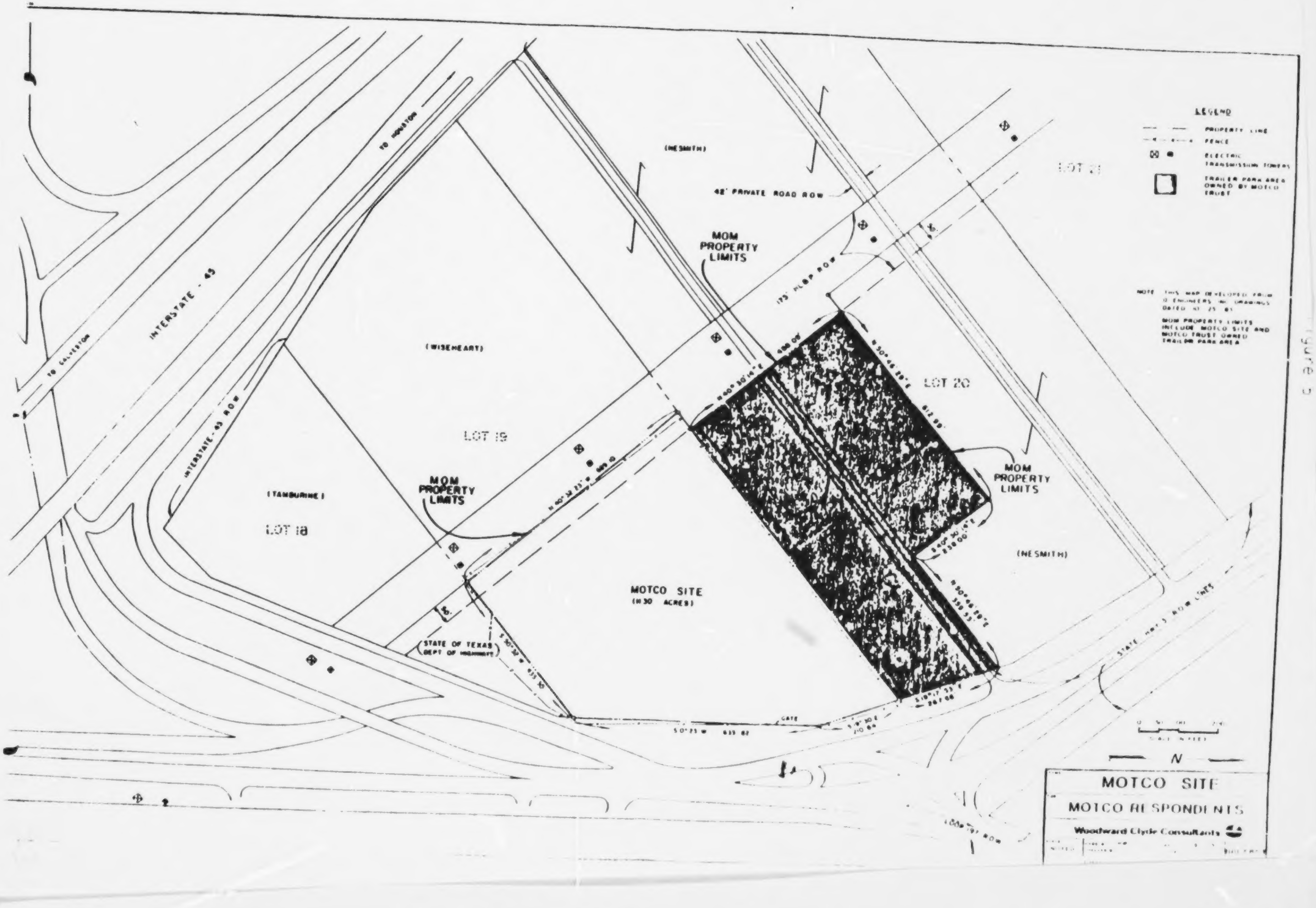
OU 1: Source Control

OU 2: Management of Migration (MOM)

The EPA has previously selected a remedial action for the Source Control Operable Unit and the ROD process was completed on March 15, 1985, when the ROD for Source Control was signed. Source Control involved the remediation of several waste pits that contain about 12 million gallons of contaminated water and organic waste liquids. This remedy also includes the excavation of the existing waste pits to the sludge/soil interface plus one foot and incineration of those wastes. The design and construction of the Source Control ROD remedy is now under way and primarily consists of an onsite mobile incinerator and ancillary facilities. The completion of the incinerator construction is expected by late 1989. After the trial burn is conducted in November, 1989, incineration of the onsite waste should begin, and is expected to take about three years to complete.

The Management of Migration Operable Unit addresses the wastes or contaminated environmental media that have migrated below the waste pits (waste sources) and beyond the site boundaries in both the surface and subsurface environmental media. Figure 5 illustrates the MOM activity areas, including the trailer park. The potential for migration of contaminants that were investigated in this operable unit include the following media:

Figure 5


LEGEND
PROPERTY LINE
FENCE
ELECTRIC TRANSMISSION TOWERS
TRAILER PARK AREA OWNED BY MOTCO TRUST
NOTE: THIS MAP DEVELOPED FROM [illegible] ENGINEERS INC DRAWINGS DATED [illegible] 25 [illegible]
MOM PROPERTY LIMITS INCLUDE MOTCO SITE AND MOTCO TRUST OWNED TRAILER PARK AREA
LOT 21
LOT 20
LOT 19
LOT 18
(NESMITH)
(NESMITH)
(WISEHEART)
(TANBURINE)
MOM PROPERTY LIMITS
MOM PROPERTY LIMITS
MOM PROPERTY LIMITS
MOM PROPERTY LIMITS
42' PRIVATE ROAD ROW
175' HL&P ROW
MOTCO SITE
(±30 ACRES)
STATE OF TEXAS (DEPT OF HIGHWAYS)
GATE
612.89'
496.08'
350.33'
230.00'
433.82
INTERSTATE - 45
INTERSTATE-45 ROW
TO HOUSTON
TO GALVESTON
STATE HWY 3 ROW LINES
100' HL&P ROW
SCALE IN FEET
N
MOTCO SITE
MOTCO RESPONDENTS
Woodward-Clyde Consultants

1. Surface Soils
2. Surface Sediments
3. Surface Water
4. Nearby Biota
5. Subsurface Soils
6. Shallow Ground Water
7. Deep Ground Water

The management of contaminant migration within these environmental media is the objective of the second operable unit RI/FS process. Any remedial action that results from this RI/FS process is to provide two primary functions. The functions of a management of migration (MOM) remedial action are as follows:

1. Isolate, remove, treat, and/or dispose of environmental media contaminated by the waste source, in order to remove or reduce a threat to the public health and environment; and
2. prevent further contamination of these environmental media.

5. SUMMARY OF SITE CHARACTERISTICS

Previous investigations have shown that the seven pits identified earlier in this document contain several strata, including surface water; organic liquids; and various sludges, tars, and other solids. Waste constituents include polymeric (primarily styrene) tars, chlorinated hydrocarbons, spent catalysts, and other chemicals. After the Source Control remediation has been completed, these waste sources will no longer exist on the site. (See previous EPA ROD dated March 15, 1985, for Source Control site characteristics.)

Concentrations of contaminants associated with waste sources will remain in various environmental media after Source Control remediation. The characterization of each affected or potentially affected medium is discussed in the following sections. A complete list of chemicals detected at the site during the MOM is available in the RI/FS documents.

5.1. AIR

Previous investigations did not detect high levels of organics in the ambient air. Potential sources of air emissions include the onsite pits and, to a lesser degree, the residual soils. Routine monitoring data collected during field operations did not exceed health and safety program action levels for worker protection. Fugitive dust emissions were not detected during field activities. Air monitoring is continuing as part of the Source Control activities.

Air emissions are expected to be a concern during remediation of the waste pits and will be controlled and monitored while this work is conducted. After the Source Control remediation has eliminated these pits, air emissions from residual site conditions are not expected to be a concern.

5.2 SURFACE WATER AND DITCH SEDIMENTS

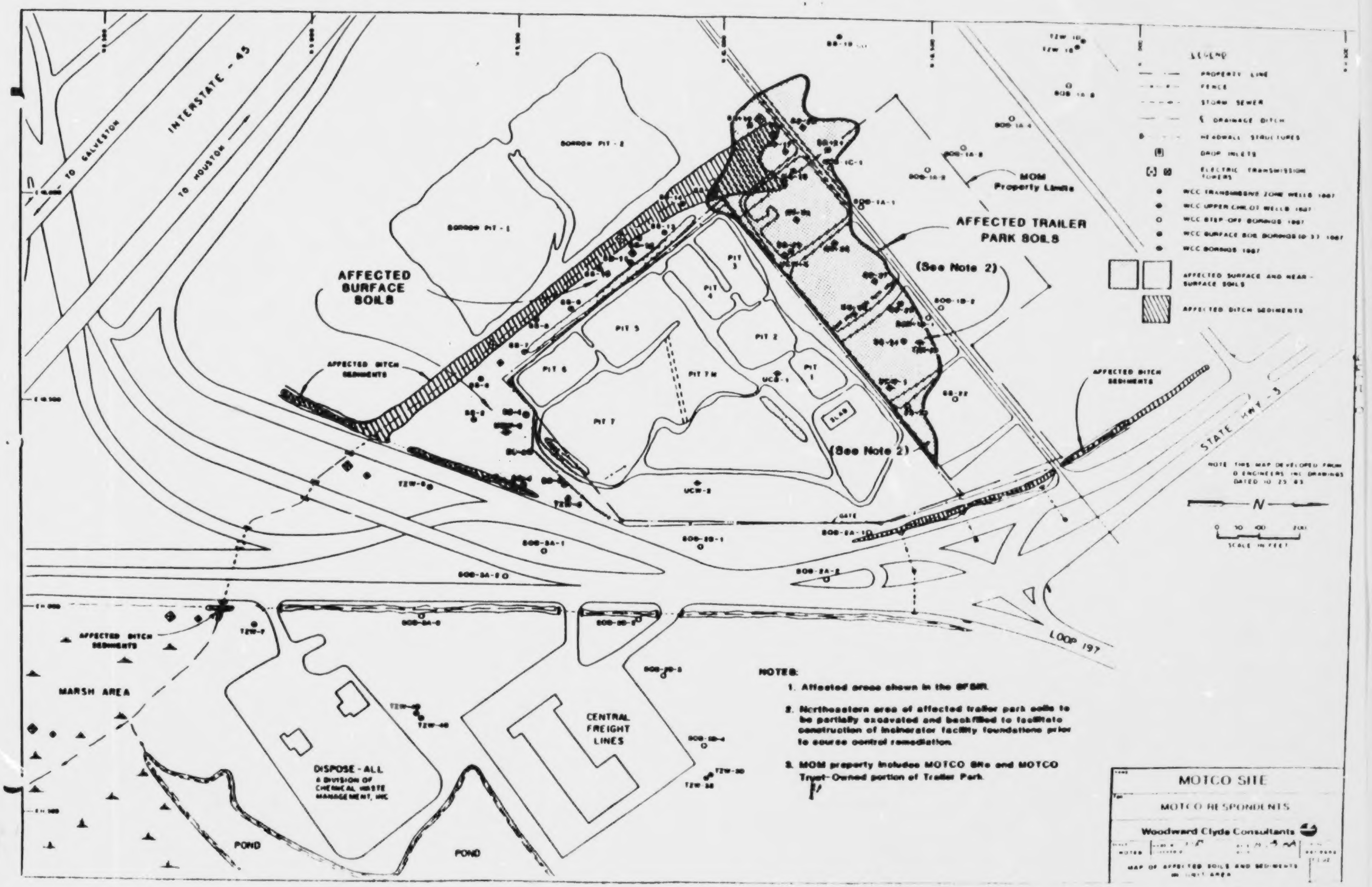
The MOTCO site is in the Highland Bayou drainage basin. Galveston Bay is approximately 2 miles from the site, and the Jones Bay/Trinity/San Jacinto estuary is about 1.5 miles to the south. Site drainage is towards the south and east by way of drainage ditches. Some additional drainage occurs through ditches located along the southwestern perimeter of the site. Site drainage ultimately reaches Jones Bay via a drainage ditch. This ditch contains headwaters which feed a 7.75 acre pond located behind the Dispose-All facility. The site appears to be free from flooding by river sources although the drainage gradient is low and water tends to pond in low areas and drain away from the site slowly.

The surface waters adjacent to and downgradient from the MOTCO site do not appear to be affected, with the exceptions of arsenic and copper in the HL&P ditch directly west of the site. These compounds were slightly above background levels for the area.

Sediments in the HL&P and highway right-of-way ditches contain detectable levels of heavy metals (including arsenic, cadmium, chromium, copper and lead). The ditch sediments in the HL&P right-of-way west of the site contain low concentrations of organic contaminants. Figure 6 delineates the affected ditch sediments estimated for the MOM area, and Table 2 provides indicator chemical concentrations in off-site sediments. A total volume of approximately 2,300 cubic yards of affected ditch sediments was calculated based on estimates of the ditch widths and assuming that between 6 and 12 inches of sediments are present (See Figures 6 and 7).

5.3 SURFACE SOILS

Affected onsite surface soils exist in the diked tank farm area and the overflow area. These soils, along with miscellaneous debris and buried metals, will be excavated and remediated as part of the Source Control


LEGEND
PROPERTY LINE
FENCE
STORM SEWER
℄ DRAINAGE DITCH
HEADWALL STRUCTURES
DROP INLETS
ELECTRIC TRANSMISSION TOWERS
WCC TRANSMISSIVE ZONE WELLS 1987
WCC UPPER CHICOT WELLS 1987
WCC STEP-OFF BORINGS 1987
WCC SURFACE SOIL BORINGS (0-3') 1987
WCC BORINGS 1987
AFFECTED SURFACE AND NEAR-SURFACE SOILS
AFFECTED DITCH SEDIMENTS
AFFECTED TRAILER PARK SOILS
(See Note 2)
AFFECTED SURFACE SOILS
AFFECTED DITCH SEDIMENTS
MOM Property Limits
BORROW PIT - 1
BORROW PIT - 2
PIT 1
PIT 2
PIT 3
PIT 4
PIT 5
PIT 6
PIT 7
PIT 7 N
SLAB
GATE
INTERSTATE - 45
TO GALVESTON
TO HOUSTON
STATE HWY - 3
LOOP 197
CENTRAL FREIGHT LINES
DISPOSE-ALL A DIVISION OF CHEMICAL WASTE MANAGEMENT, INC
MARSH AREA
POND
POND
N
0 50 100 200
SCALE IN FEET

NOTE: THIS MAP DEVELOPED FROM O ENGINEERS INC DRAWINGS DATED 10 25 83

NOTES:

1. Affected areas shown in the SFSIR.
2. Northeastern area of affected trailer park soils to be partially excavated and backfilled to facilitate construction of incinerator facility foundations prior to source control remediation.
3. MOM property includes MOTCO Site and MOTCO Trust-Owned portion of Trailer Park.

MOTCO SITE

MOTCO RESPONDENTS

Woodward Clyde Consultants

MAP OF AFFECTED SOILS AND SEDIMENTS IN UNIT AREA

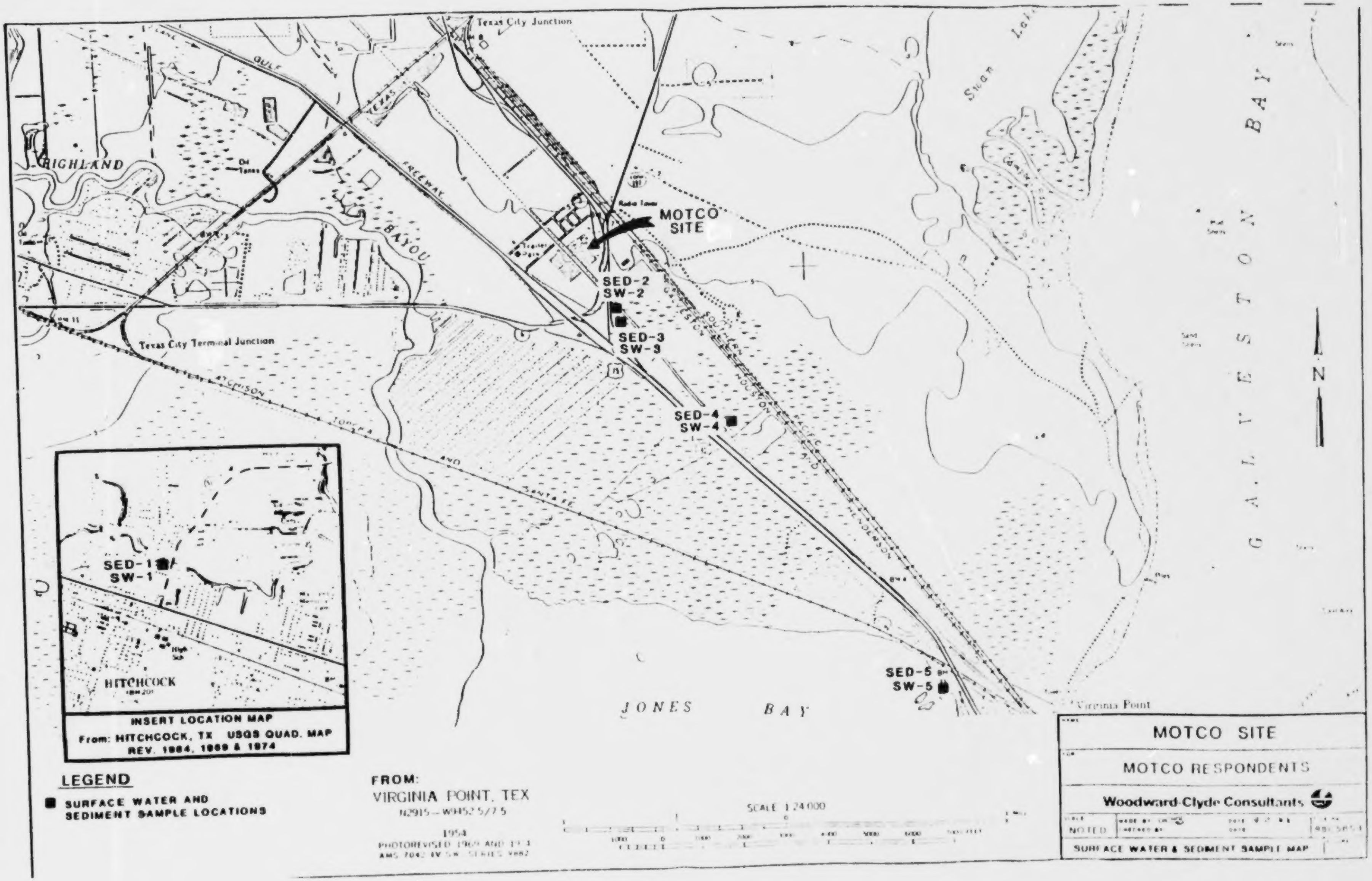

Texas City Junction
GULF
TEXAS
FREEWAY
HIGHLAND
BAYOU
Texas City Terminal Junction
ATCHISON TOPEKA AND SANTA FE
GALVESTON HOUSTON AND HENDERSON
SOUTHERN PACIFIC
MOTCO SITE
SED-2
SW-2
SED-3
SW-3
SED-4
SW-4
SED-5
SW-5
Swan Lake
GALVESTON BAY
JONES BAY
Virginia Point
N
SED-1
SW-1
HITCHCOCK
INSERT LOCATION MAP
From: HITCHCOCK, TX USGS QUAD. MAP
REV. 1984, 1969 & 1974
LEGEND
■ SURFACE WATER AND SEDIMENT SAMPLE LOCATIONS
FROM:
VIRGINIA POINT, TEX
N2915—W9452.5/7.5
1954
PHOTOREVISED 1969 AND 1973
AMS 7042 IV SW—SERIES V882
SCALE 1:24 000
MOTCO SITE
MOTCO RESPONDENTS
Woodward-Clyde Consultants
NOTED
SURFACE WATER & SEDIMENT SAMPLE MAP

Figure 7

activities. Other surface soils within the site will be capped with 3 feet of low permeability clay soil and graded to provide drainage.

Affected surface soils were identified in three areas beyond the MOTCO site boundary:

1. Area just west of site boundary (approximately 13,000 square feet);

2. area just south of site boundary (approximately 42,000 square feet); and

3. area just north of the site boundary within the abandoned trailer park (approximately 194,000 square feet).

Figure 6 delineates the affected surface soils in these areas.

The first two areas are each about 5 feet deep and together contain a total of approximately 10,000 cubic yards. The third area, within the abandoned trailer park, is discussed in the following paragraphs.

Both surface and subsurface soils in the abandoned trailer park to the north of the MOTCO site are affected. A generalized area of affected soils near the surface was delineated in the SFSI based upon chemical measurements and visual observations from soil borings and test trenches. Principal contaminants detected in these areas were chromium, copper, lead, 1,1-dichloroethene, 1,2-dichlorethane, total 1,2-dichlorethene, 1,1,2-trichlorethane, benzene, toluene, ethyl benzene, styrene, total xylenes, bis(2-chloroethyl) ether, 2-methyl naphthalene, phenanthrene, fluoranthrene and pyrene. Visually affected trailer park soils have been calculated to include about 30,000 cubic yards within 4 feet of the ground surface.

5.4 SUBSURFACE SOILS

Affected subsurface soils (soils generally below a 4 foot depth) have been identified:

1. At the base of the existing sludge pits and at various onsite locations to a depth of 50 feet below grade; and

2. various locations offsite within the transmissive zone, including the abandoned trailer park.

Approximately 30,000 cubic yards of subsoil within 3 feet beneath or adjacent to the sludge pits are affected. The estimated depth of affected soil was based on a review of data from sludge pit borings. In general, volatile and total extractable organic compounds were in the range of 100 ppm to 3000 ppm within the 3 feet of soil. Affected pit subsoils will be excavated to a depth of 1 foot below the sludge/soil interface and treated along with the pit sludges during the Source Control remedial activities. This excavation will account for approximately 10,000 cubic yards of material. The data indicate that remaining subsoils (1-3 foot depths) will have total volatile and total extractable organic compounds generally between 10 and 350 ppm.

The leachability of the residual pit subsoils after Source Control remediation was evaluated with regards to their impacts on Transmissive Zone ground water. Residuals from pit subsoils will represent a small fraction of the total volume of residual materials remaining in the Transmissive Zone. All residual contaminant levels (after sludge/soil interface material removal) will be managed as a part of the ground water remediation for the site.

In addition to the onsite contaminated subsurface soils, affected subsurface soils were identified in areas south of the MOTCO site at depths of approximately -25 to -30 feet MSL and -45 to -55 feet MSL and just east of the site at depths -45 to -55 feet MSL. These locations correspond to the sand/clay interface at the bottom of the Transmissive Zone units 2 and 3, and may have resulted from the accumulation of chemical contaminants that have migrated vertically until a relatively impermeable clay layer was reached. These two areas correspond to the presence of dense non-aqueous phase liquids (DNAPL's) in the Transmissive Zone ground water.

The principal chemical contaminants detected in the subsurface soils were 1,1-dichloroethane, 1,2-dichloroethane, 1,2-dichloroethene, 1,1,2-trichloroethane, benzene, ethyl benzene, toluene, styrene, total xylene, bis(2-chloroethyl)ether, bis(2-chloroisopropyl)ether, naphthalene, 2-methyl naphthalene, and phenanthrene.

Analytical samples for onsite subsurface soils detected high levels (greater than 500 ppm) of 1,1,2-Trichloroethane, Naphthalene, and 1,2-Dichloroethane. Medium levels (greater than 10 ppm and less than 500 ppm) of 1,2-Dichloroethene, Benzene, Toluene, Ethylbenzene, Total Xylenes, 2-Methylnaphthalene, Fluorene, Phenanthrene, Pyrene, Acenaphthylene, Acenaphthene, Anthracene, and bis(2-Chloroethyl)Ether.

Concentrations of Barium, Copper, lead, Arsenic, and Chromium detected in the onsite subsurface samples were above background, but within the range of average soil concentrations for these metals.

Analytical samples from the off-site subsurface areas detected high levels of bis(2-Chloroethyl)Ether (700 mg/kg) and 1,1,2-Trichloroethane (1200 ppm). Medium levels of Naphthalene, bis(2Chloroisopropyl)Ether, 2-Methylnaphthalene, Phenanthrene, Benzene, 1,2-Dichloroethane, 1,1,2-Trichloroethane, Toluene, Ethylbenzene, Styrene, Pyrene, and Total Xylenes were detected in the off-site subsurface.

Affected subsurface soils are present under the surface soil zone in the trailer park and were estimated to reach a maximum depth of between 19 and 21 feet below the ground surface. The estimated total of affected trailer park soils (surface and subsurface) has been calculated to be 90,000 to 100,000 cubic yards.

The presence of free phase product (i.e., DNAPL's) was detected in seven transmissive zone wells. The extent of free organic phase product is localized offsite in two areas:

1. Area directly southwest of the site; and

2. area directly northwest of the site.

The extent of DNAPL's directly under the existing waste pits is unknown at this time. The known volume of DNAPL's has been estimated to be 1 to 2 million gallons. (See Figure 8).

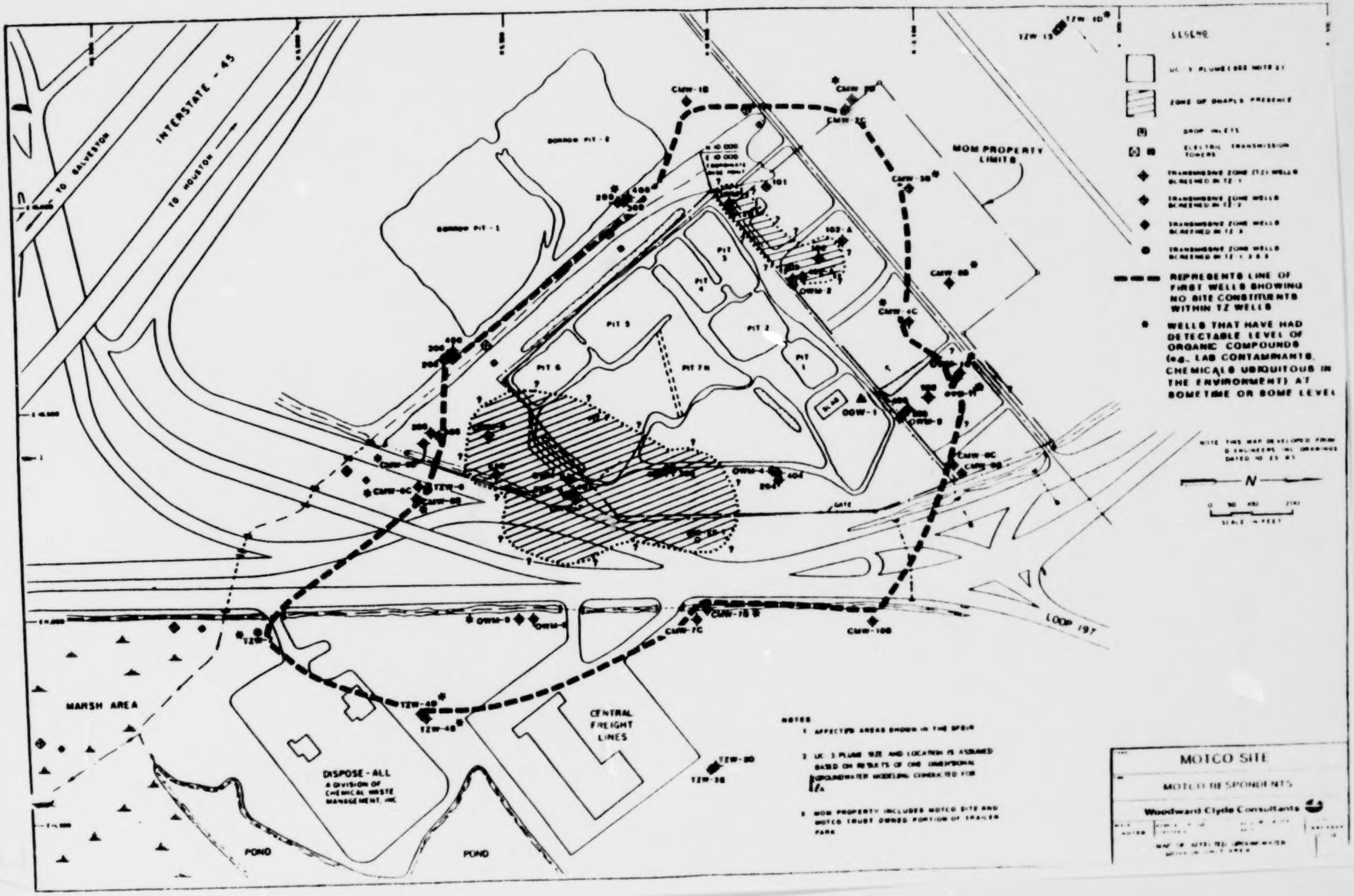
5.5 GROUND WATER

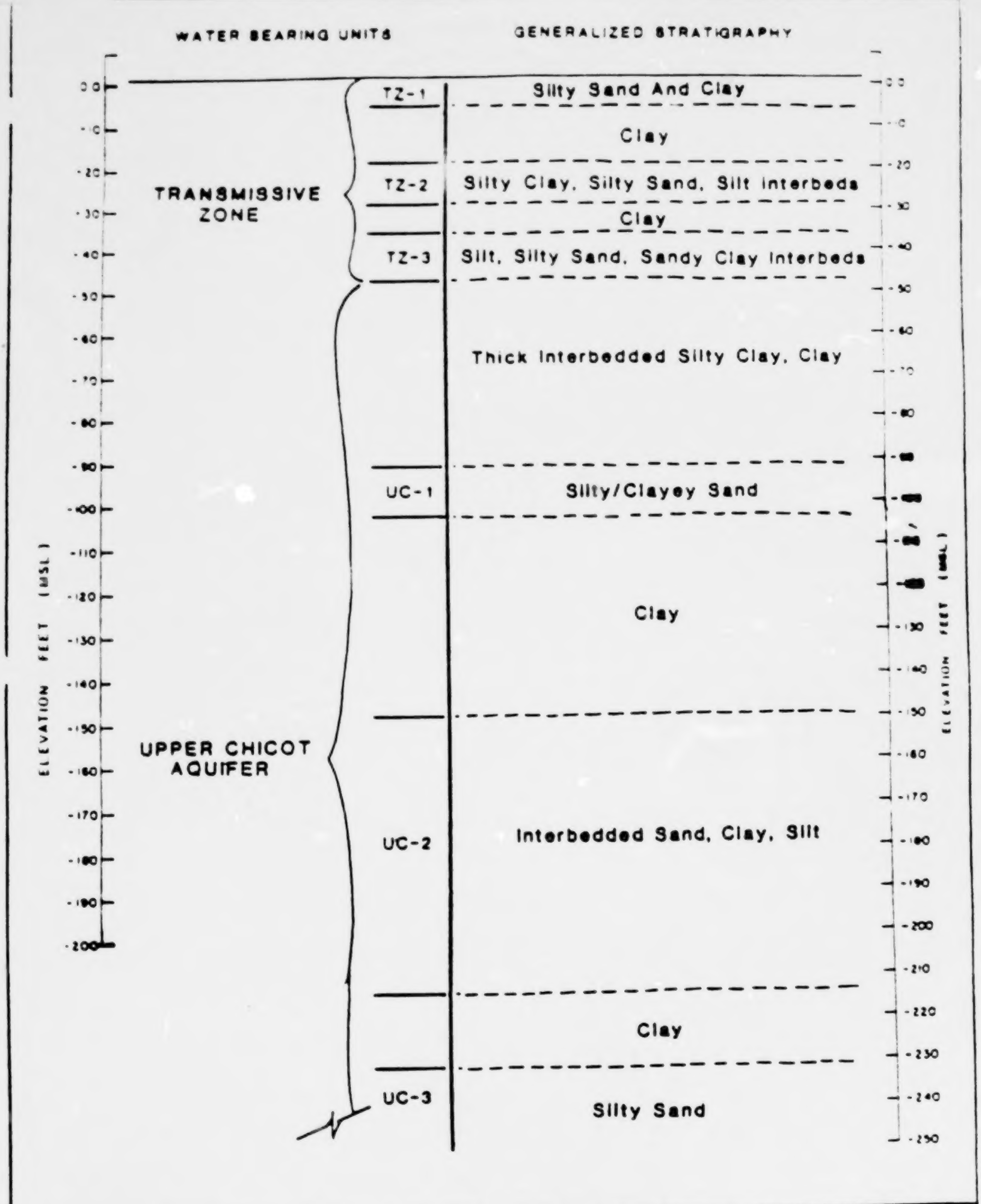
5.5.1 Hydrogeology

The hydrogeologic profile at the MOTCO site is divided into a Transmissive Zone and Upper Chicot aquifer. The hydrogeologic elements of the Transmissive Zone (TZ) consist of of TZ-1 (approximately 0 to -5 feet MSL), TZ-2 (approximately -18 to 28 feet MSL) and TZ-3 (approximately -35 to -48 feet MSL). These units vary in thickness, depth and continuity across the site. TZ-3 is the most homogeneous and areally extensive. TZ-2 appears to be the most permeable layer. All three zones appear to be interconnected. Horizontal ground water flow in the Transmissive Zone is generally in a south to southeast direction at a seepage velocity ranging from 0.2 to 10 feet per year. There is some TZ flow in a northwesterly direction from the site, as well. (Figure 9).

The Upper Chicot clays overlying the Upper Chicot Aquifer vary in thickness from 20 to 48 feet accross the site. Laboratory permeability tests and one field pumping test indicated that hydraulic conductivity of the clay-

Figure 8


LEGEND
UC 3 PLUME (SEE NOTE 2)
ZONE OF DNAPLS PRESENCE
DROP INLETS
ELECTRIC TRANSMISSION TOWERS
TRANSMISSIVE ZONE (TZ) WELLS SCREENED IN TZ 1
TRANSMISSIVE ZONE WELLS SCREENED IN TZ 2
TRANSMISSIVE ZONE WELLS SCREENED IN TZ 3
TRANSMISSIVE ZONE WELLS SCREENED IN TZ 1, 2 & 3
REPRESENTS LINE OF FIRST WELLS SHOWING NO SITE CONSTITUENTS WITHIN TZ WELLS
WELLS THAT HAVE HAD DETECTABLE LEVEL OF ORGANIC COMPOUNDS (e.g., LAB CONTAMINANTS, CHEMICALS UBIQUITOUS IN THE ENVIRONMENT) AT SOMETIME OR SOME LEVEL
NOTE: THIS MAP DEVELOPED FROM ENGINEERS, INC. DRAWINGS DATED 10 23 87
N
SCALE IN FEET
NOTES
1 AFFECTED AREAS SHOWN IN THE SPSIR
2 UC 3 PLUME SIZE AND LOCATION IS ASSUMED BASED ON RESULTS OF ONE DIMENSIONAL GROUNDWATER MODELING CONDUCTED FOR
3 MOM PROPERTY INCLUDES MOTCO SITE AND MOTCO TRUST OWNED PORTION OF TRAILER PARK
MOTCO SITE
MOTCO RESPONDENTS
Woodward Clyde Consultants
MAP OF AFFECTED GROUNDWATER
INTERSTATE - 45
TO GALVESTON
TO HOUSTON
BORROW PIT - 1
BORROW PIT - 2
PIT 1
PIT 2
PIT 3
PIT 4
PIT 5
PIT 6
PIT 7A
SLAB
MOM PROPERTY LIMITS
LOOP 197
GATE
CENTRAL FREIGHT LINES
DISPOSE - ALL
A DIVISION OF CHEMICAL WASTE MANAGEMENT, INC.
MARSH AREA
POND
POND
CMW-1B
CMW-2C
CMW-3B
CMW-4C
CMW-6B
CMW-6C
CMW-7C
CMW-10B
CMW-15B
OWW-1
OWW-2
OWW-4
OWW-6
OWW-8
OGW-1
TZW-1B
TZW-1D
TZW-3B
TZW-3D
TZW-4B
TZW-4D
101
102-A
200
204
300
400


WATER BEARING UNITS
GENERALIZED STRATIGRAPHY
ELEVATION FEET (MSL)
0.0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
-170
-180
-190
-200
-210
-220
-230
-240
-250
TRANSMISSIVE ZONE
UPPER CHICOT AQUIFER
TZ-1
TZ-2
TZ-3
UC-1
UC-2
UC-3
Silty Sand And Clay
Clay
Silty Clay, Silty Sand, Silt Interbeds
Clay
Silt, Silty Sand, Sandy Clay Interbeds
Thick Interbedded Silty Clay, Clay
Silty/Clayey Sand
Clay
Interbedded Sand, Clay, Silt
Clay
Silty Sand

NAME MOTCO SITE	Woodward-Clyde Consultants	GENERALIZED HYDROGEOLOGIC PROFILE	FILE NO. 88C5653
FOR MOTCO RESPONDENTS	SCALE NOTED · MADE BY PZ · DATE 5-11-88 · CHECKED BY · DATE		FIGURE

Figure 9

confining layer ranged from a high of $1X10^4$ cm/sec to a low of $8X10^8$ cm/sec. Based on an average porosity of 20% and the hydraulic conductivity, the estimated hydraulic gradient is 0.22 feet per year. This means that it will take approximately four years for fluids to travel one foot through the Upper Chicot Clay. Therefore, the Upper Chicot Clay provides some degree of confinement between the Transmissive Zone and the Upper Chicot Aquifer.

The Upper Chicot Aquifer is subdivided into three water bearing units: Upper Chicot 1 (UC-1) is generally between -90 to -105 feet MSL, Upper Chicot 2 (UC-2) is generally between -150 to -210 feet MSL, and the Upper Chicot 3 (UC-3) is below -230 feet MSL. The exact depth and thicknesses of these units vary across the site.

The only identified potential point source that could have affect the UC-1, UC-2, and UC-3 aquifers was an old abandoned deep process well (OOW-1) located on the MOTCO site near pit #1. This well was sampled during the RI/FS field activities and has since been removed. A search for other abandoned wells was performed and none found.

In addition to OOW-1, there is a potential for vertical migration of ground water contaminants through the underlying clays into the Chicot Aquifer.

5.5.2 Ground Water Quality

Figure 8 shows the estimated delineation of affected ground water media associated with the MOTCO site. The extent of the plume in the UC-3 was estimated based on the projected migration of contaminants from well OOW-1 from 1959 until the well was removed. The boundary of the plume shown for the TZ is a line drawn through the wells closest to the site in which no contaminants were detected.

Ground water contaminant plumes in the TZ have been identified in two areas. One plume extends approximately 500 feet past the southeast site boundary. The second plume extends about 300 feet beyond the northern site boundary. The estimated total volume of affected TZ ground water is about 30 to 40 million gallons. The primary contaminants detected include: 1,1-dichlorethane, total 1,2-dichloroethane, 1,1,2-trichloroethane, bis(2-chloroethyl)ether, naphthalene, benzene, tolluene, ethyl benzene, total xylenes, styrene.

The primary compounds detected in the Transmissive Zone in high levels was bis(2-Chloroethyl)Ether (960ppm) and medium levels (greater than 10 ppm and less than 500 ppm) of 1,2-Dichloroethane, Benzene, 1,1,2-Trichloroethane, Vinyl Chloride, Toluene, Ethylbenzene, Styrene, Xylene, bis(2-Chloroisopropyl)Ether, Naphthalene, and 2-Methylnaphthalene.

The estimated volume of the UC-3 plume was calculated to be about 6 to 10 million gallons based upon modeling and historic data. The primary compounds detected at low levels (below 10 ppm) were Vinyl Chloride, 1,2-Dichloroethane, 1,1-Dichloroethene, and Benzene.

Table 1 presents the final list of indicator chemicals chosen for the MOTCO site during the endangerment assessment process, and an estimate of potential significant impacts to public health or the environment.

5.5.3 Ground Water Wells and Classification

The private wells in the site vicinity are either abandoned or used for non-potable purposes. Reportedly, the former residents of the abandoned trailer park northwest of the MOTCO site obtained water from the City of La Marque. Both Central Freight and the Dispose-All facility, south across Highway 3 from the site, have a water well on their property. These wells are about 800 to 450 feet deep. The nearest subdivisions, Bayou Vista and Omega Bay, obtain water from the Galveston County Water District. The closest residential well, (2000 feet from the MOTCO site) is screened in the Upper Chicot. The residence is now served by the La Marque municipal water system.

The Upper Chicot is considered to be a Class 2 aquifer due to its potential use as a potable water supply, based on water quality and sufficient yield to supply a drinking water well. Therefore, MCL's or appropriate health-based numbers (10^{-6}) will be the applicable clean-up standards.

The TZ is considered to be a class III-A aquifer due to its high levels of naturally occurring chlorides and total dissolved solids and the potential to impact a potable water source (Upper Chicot). Although it is not currently being utilized as either a process water or potable water source, the transmissive zone will need to be remediated to selected target levels in order to insure protection of the Upper Chicot Aquifer.

5.6 DEMOGRAPHY AND LAND USE

Approximately 3000 people live within a 1-mile radius of the site, and about 12,000 people live within a 3-mile radius. Pertinent residential features in the vicinity of the site are the Omega Bay subdivision (1500 feet west-southwest), the village of Bayou Vista (1500 feet south-southwest), and the Narvaez residence (2000 feet northwest).

Land use within the area is divided principally among industry, urban-business, agriculture, and marsh-covered tracts with abundant wildlife.

Table 1

FINAL LIST OF INDICATOR CHEMICALS

		Environmental Media of Concern		
	Carcinogen	SW	GW	S
		Potential Impacts(1)		
Metals				
Arsenic	X	M	H	H
Barium		M	H	H
Cadmium	X(2)	L	L	L
Chromium (VI & III)	X(2)	L	L	H
Copper		M	L	M
Lead		M	H	H
Mercury		L	L	M
Selenium		L	L	M
Volatiles				
Benzene	X	M	H	L
Carbon Disulfide		L	L	M
1,2-Dichloroethane	X	M	H	M
1,1-Dishloroethylene	X	M	H	M
1,1,2-Trichloroethane	X	M	H	H
Vinyl Chloride	X	M	H	M
Semi-Volatiles				
bis(2-Chloroethyl)ether	X	M	H	H
Polycyclic Aromatic Hydrocarbons				
Benzo(a)anthracene	X	L	L	H
Benzo(a)pyrene	X	L	L	H
Chrysene	X	L	L	H
Naphthalene		L	L	H
Phenanthrene		L	L	H

(1) Preliminary estimate of potential significant impacts (public health or environmental) based on media concentrations in the SFSI (WCC 1988).

(2) Considered by EPA to be carcinogenic by the inhalation route of exposure only (IRIS 1988).

SW = Surface Water
GW = Groundwater
S = Soil
L = Low Level of Concern
M = Medium Level of Concern
H = High Level of Concern
X = Suspected Carcinogen

Railroads, highways, pipelines, and power transmission systems cross the area. The nearby bay and estuary waters are used for commercial and sport fishing, recreation, transportation, and mineral production.

6. SUMMARY OF SITE RISKS

6.1 OVERVIEW

The objective of the MOTCO Endangerment Assessment was to characterize the site in relation to potential public health and environmental impacts resulting from:

1. Migration of residual site contaminants after completion of currently planned on-site source remediation; and
2. contaminants that have migrated off-site prior to source remediation.

In order to characterize the potential public health and environmental impacts associated with the no-action alternative, three scenarios (i.e., current, future, and residential) were evaluated in the MOTCO Endangerment Assessment Report (EA). For purposes of the EA, evaluation of health and environmental risks under the above mentioned scenarios constitutes a baseline health risk evaluation. The results from the exposure and risk characterization for the baseline health risk assessment are provided in Sections 6 and 7 of the MOTCO EA.

6.2 HAZARD IDENTIFICATION

In order to focus on the chemicals of greatest concern to public health and the environment, the EA selected and evaluated a list of 20 indicator chemicals. The process for selection of these chemicals is found in chapters 4 and 5 of the MOTCO Endangerment Assessment. The final list of indicator chemicals includes 20 chemicals that best represent the site in terms of toxicity and media concentrations and to a lesser degree, extent, mobility and prevalence. The carcinogens included on the list account for greater than 99 percent of the total estimated cancer risk associated with human exposure to soils and water affected by these chemicals.

The final indicator list also includes 10 noncarcinogens which best represent the site in regard to potential noncancer adverse health effects. These chemicals were chosen based on their overall ranking as noncarcinogens.

Samples collected as part of the SFSI from soils, ground water, DNAPL's, surface water, sediments, and biota were analyzed in the laboratory for the Hazardous Substance List (HSL) metals, copper, HSL organics, (volatiles and semi-volatiles), pesticides, and PCB's.

6.3 EXPOSURE ASSESSMENT

The purposes of the Exposure Assessment are to identify actual or potential exposure pathways, characterize the potentially exposed human populations (including sensitive and/or environmental receptors), and quantify the extent of exposure.

An exposure assessment is based on the general assumption that a chemical must move from a source via an environmental pathway to a receptor to cause an effect. In the MOTCO Endangerment Assessment potential receptors (human and environmental) were determined based on land use and demographic considerations as well as evaluation of appropriate pathways. Several environmental pathways connecting sources and receptors were discussed, including air, water (ground water and surface water), soil (sediment, surface, and subsurface), and the food chain (biota). Three scenarios were assumed for the pathway and exposure analysis: Current conditions, future conditions, and a residential scenario (worst case). Details of exposure assessment are outlined in Chapter 6 of the Endangerment Assessment Report.

6.3.1 Current Conditions

Air Pathway

The MOTCO MOM Endangerment Assessment was concerned with potential for adverse effects on public health and the environment following source removal and remediation. The major source of air emissions from the site is currently the onsite pits and soils. These are areas to be remediated, and the air pathway was addressed by the MOTCO Source Control Operable Unit. Therefore, the potential for migration of contaminants in the air from the MOTCO site, after source removal, is postulated to be low compared to existing conditions prior to site remediation. Emissions from other sources (e.g., the abandoned Trailer Park) would also be expected to be relatively low. In order to assess the potential for off-site migration of chemicals from off-site sources via the air pathway, available air monitoring data were evaluated for the existing conditions at the site (prior to remediation).

The compounds detected in air samples were primarily chlorinated hydrocarbons and aromatics (e.g., benzene). Chlorinated hydrocarbons were detected downwind of the pits and were assumed to be associated with the pits. Significant levels of chlorinated hydrocarbons were not detected in the trailer park area upwind of the pits. There was no significant increase in benzene detected in the air downwind as compared to upwind samples. The results of the investigation suggest that volatile organics may be emitted at the site from the open pits at detectable levels, but not from the off-site sources.

In summary, the potential for exposure to volatile organic vapors and particulates released from off-site sources in the air is assumed to be relatively low compared to the other pathways. For particulates, high soil moisture content, extensive vegetation, and the results of air sampling suggest that fugitive dust emissions would not contribute appreciably to these overall human exposures computed in the risk evaluation. Consequently, off-site air emissions were not quantified in the MOTCO MOM Endangerment Assessment.

Ground Water

Four Potential ground water pathways were identified for evaluation in the MOTCO EA:

1. Migration of contaminants through Transmissive Zone horizontally to nearby surface water.
2. Migration of contaminants vertically to the underlying Upper Chicot. (Hypothetical Well #2)
3. Migration of contaminants from UC-3 horizontally to nearby drinking water well. (Hypothetical Well #1)
4. Migration of contaminants from Transmissive Zone to process wells downgradient from site.

With the possible exception of the Central Freight process well, which is approximately 800 feet deep, there is no confirmed use of any wells within 3000 feet of the MOTCO site. The Central Freight well is used only for cleaning operations as the natural water quality is impaired apparently due to high salinity. Nevertheless, it is possible that human exposures to chemicals found in any of the Upper Chicot units may ultimately occur from occupational or domestic uses of water from these wells. Currently, the public water supply is from surface water sources such as the Brazos River and Lake Houston. The Omega Bay and Bayou Vista communities receive water from the Galveston County Water District. Private wells in the site vicinity are thought to be either abandoned or used for non-potable purposes.

Surface Water and Sediments

Chemicals may migrate in surface water during storm events or in natural flow of streams and drainage channels. At the Motco Site, surface water drains from the site into open ditches at the edge of the property. Drainage ditches may then discharge to the marsh areas found nearby.

There is also the potential for chemicals migrating in the ground water to affect surface water.

Surface Soils

Chemicals may migrate vertically and laterally through soil depending on the physical and chemical properties of the soil and the chemical. Most organic chemicals and metals are retarded by adsorption to soil particles rendering them less mobile in soil. Thus, the ground water quality could be impacted through compounds existing in overlying soils. The main pathway for exposure, however, would be from ingestion of surface soils.

Food Chain

The coastal marshes and estuarine system bordering the MOTCO Site serve as spawning and nursery areas for many species of fish and shellfish. The wetland areas also serve as wintering grounds for many species of waterfowl such as ducks, geese, and cranes.

Surface water and sediments near the site may be affected by ground water migration, surface water runoff, or air deposition of particles. According to land use data, the ponds adjacent to the MOTCO site are not typically visited. This is likely the result of the difficult access to the site, the poor supply of fish (or other biota) in these ponds, and the more appealing recreational areas found locally at points away from the MOTCO site.

6.3.2 FUTURE CONDITIONS - Residential Scenario

Ground Water:

The worst-case cumulative cancer risk to a hypothetical resident near the site is 54,000 in a million (5.4E-02) for hypothetical well 1 (HW-1) and 140,000 in a million (1.4E-01) for hypothetical well 2 (HW-2). The major portion of the risk is primarily related to ingestion of ground water, with total risks being approximately 3.5 times higher for HW-2 than HW-1. For both wells, the majority of the risks from ground water consumption is due to high doses and cancer potencies for vinyl chloride, bis(2-chloroethyl)ether, and arsenic.

Hypothetical consumption of and dermal contact with water from Well HW-1 exhibited no margin of safety (i.e., the Hazard Index was approximately 1.0) for exposure to lead. This represents a potential for noncancer health effects associated with exposure from HW-1.

Surface Water and Sediments

Total cancer risks for surface water exposures, 9.6 in a million, and excess risks for sediment exposures, 0.3 and 44 (mean and maximum) are appreciably lower than either potential exposure to ground water or surface soils.

The calculated doses of chemicals in surface soils and sediments from each route of exposure did not exceed their reference doses for noncancer risks.

Surface Soils

Potential exposure to trailer park soils contributes appreciably to the cumulative individual cancer risks associated with the MOTCO Site. Under the worst-case (residential scenario) the cancer risks from ingestion of and dermal contact with surface soils by a hypothetical resident are 21,000 in a million (2.1E-02) and 140 in a million (1.4E-04) for maximum and mean concentrations, respectively.

Although calculated doses did not exceed corresponding reference doses for any chemical in the trailer park soils, the hazard indices for dermal contact with and ingestion of maximum concentrations of barium, napthalene, or lead are close to their respective threshold levels for noncancer effects.

Food Chain

According to the results of sampling and the cancer risk estimates, the potential consumption of biota obtained from nearby surface waters may result in risks of 47 and 120 in a million (4.7E-05 and 1.2E-04) (mean and maximum). The only carcinogenic chemical detected in fish was arsenic.

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TABLE 2

SUMMARY OF AFFECTED MEDIA FOR NON UNIT AREA OF CONTAMINATION

MEDIA	SPECIFIC MEDIA VOLUME, AREA OF SUBSET	CALCULATED AFFECTED QUANTITY	Constituent Group Maximum and Representative Average Concentrations (PPM)																							
			TOTAL VOCs		SEMI VOCs		TOTAL PAHs		METALS																	
									LEAD		ARSENIC		BARIUM		CADMIUM		SELENIUM		COPPER		CHROMIUM		MERCURY		SILVER	
			MAX	AVG	MAX	AVG	MAX	AVG	MAX	AVG	MAX	AVG	MAX	AVG	MAX	AVG	MAX	AVG	MAX	AVG	MAX	AVG	MAX	AVG	MAX	AVG
UR 1 UR 2 UR 3 Groundwater	(See note 5) Plume in well MW-1 Vicinity	10-15 Million 60-70 Million 6-10 Million Gallons	1.0	0.80	0.2	<0.005	0.014	<0.005	0.05	0.01		0.003	0.25	0.13		<0.004		<0.003	0.007	<0.005	0.009	<0.005		0.00012	ND	
Subsurface Zone	Plume in Units II-2 and II-3	30-40 Million Gallons	300	50	75 1200	50	50	<20	0.45	<0.005	0.046	<0.005	0.640	0.20	0.25	<0.005	0.025	<0.005	0.8	0.1	0.1	0.05	0.0009	<0.0009	ND	
	DNAPLs in Free [illegible] Zone	0.9 - 1.0 Million Gallons	50,000		450,000		35,000		11		ND		ND		ND		ND		19		ND		ND		ND	
Near Surface Affected Soil	Shallow Soils in Hwy. R.O.W. 0 - 5 ft BGS	7000 cu yd	1620	100	721	200	400	75	230	50	6	2	154	80	0.75	0.5	0.40	0.45	520	150	62	30	1.0	<1.0	ND	
	Shallow Soils in NEAP R.O.W. 0 - 5 ft BGS	2500 cu yd	1620	100	721	200	400	75	230	50	6	2	154	80	0.75	0.5	0.40	0.45	520	150	62	30	1.0	<1.0	ND	
	Trailer Park Soils 0 - 4 ft BGS	30,000 cu yd	137	25	1643	25	1200	150	200	15	1.6	1	153	75	0.65	<0.50	0.5	<0.5	100	15	30	15	1.5	<0.05	ND	
	Sludge Pits (Area Below Pits)	30,000 cu yd to 3' depth																								
	1 - 2 ft		800	300																					ND	
	2 - 3 ft		400	100																					ND	
Ditch Sediments	0 - 1 ft	2,300 cu yd	0.29	0.04	5.3	0.42	0.25	0.08	317	119	12.6	4.8	400	129	0.700	0.090	0.290	0.200	462	151	96.7	31.2	0.50	0.12 U	2.80	0.980

NOTES

(1) See Text Sec. 2.4 and Figure 2.4 for description and delineation of designated media subsets.

(2) See Appendix A for quantity estimates and volume calculations.

(3) Constituents generally based on indicator chemical developed from EA, All inputs are approximations.

(4) Near surface contamination generally resulting from surface migration of site constituents.

(5) Not known to currently be affected

ND Not Detected

U Below Analytical Detection Limits

result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at a site.

6.6.1 CURRENT CONDITIONS:

Maximum concentrations of indicator chemicals detected in UC-3 are compared in Table 19 to MCL's, AWQC, or a derived HBN for drinking water. Vinyl chloride (340x), 1,1-dichloroethylene (13x), 1,2-dichloroethane (100x), bis(2-chloroethyl)ether (167x), and benzene (7x) exceed screeing criteria. Of the metals, only lead equaled its MCL and exceeded its proposed MCL for drinking water.

Current maximum and mean concentrations of indicator chemicals in surface water were compared to either Texas Water Commission or Federal marine toxicity criteria. Only the maximum concentration for copper exceeds its marine toxicity criterion.

Water quality for the two process water wells were compared to the HBN's for process water. No chemical concentrations exceeded their respective HBN's derived for process water use.

Biota sampling downgradient from the site was conducted to characterize the potential for aquatic exposure to the indicator list. The results were discussed earlier in this document under the Exposure Assessment Section. Soil and sediment exposures are addressed under the residential scenario, as well.

6.6.2 FUTURE CONDITIONS

In modeling chemical migration in UC-3 from OOW-1 to a hypothetical well near the MOTCO site boundary (HW-1), maximum predicted concentrations in this well, assuming no decay, would exceed drinking water screening criteria for vinyl chloride (215x), 1,1-dichloroethylene ((7.4x), 1,2-dichloroethane (62x), bis(2-chloroethyl)ether (10x), and benzene (3.6x).

Predicted maximum concentrations for indicator chemicals in HW-2 (screened across UC-1,UC-2, & UC-3, modeled from the transmissive zone) are compared to drinking water screening criteria. Assuming no decay, criteria would be exceeded for vinyl chloride (155x), 1,2-dichloroethane (1283x), 1,1-dichloroethylene (3.6x), 1,1,2-trichloroethane (1647x), bis(2-chloroethyl) ether (72,700x), and benzene (79x). The time to reach these criteria would be about 500 years.

According to the model, no marine toxicity-derived criteria would be exceeded as a result of lateral migration of contamination from the Transmissive Zone to the Dispose-All pond.

Ground water migration of indicator chemicals from the transmissive zone to the two industrial wells was modeled to predict maximum concentrations in these wells. According to the model results, the HBN's for occupational exposures would not be exceeded in either of the industrial wells.

Soils and ditch sediments are discussed in the residential scenario in this section.

6.6.3 RESIDENTIAL EXPOSURE SCENARIO

For this scenario, it was assumed that a hypothetical resident living at the edge of the site obtained drinking water from HW-1 or HW-2, consumed a predetermined quantity of soil, sediments, and biota per day, and had dermal contact with water, soils, and ditch sediments. Figure 10 provides an illustration of the MOTCO Site sources, pathways, and receptors used in the model.

Cancer Risks:

The principal assumption for ground water pathway is that exposure may occur through ingestion of drinking water or from dermal contact during showering or bathing from either of the two hypothetical wells. The estimate for total cancer risks from ingestion of ground water at HW-1 is 3.3E-02 and 1.2E-01 at HW-2. For dermal contact, the total cancer risks at HW-1 is 7.0E-05, and 4.8E-04 at HW-2.

The excess individual cancer risks estimated for occasional dermal (recreational) contact and ingestion of off-site sediments is 4.4E-05. Exposure to trailer park soils may also occur through ingestion and dermal contact. The estimate of total cancer risks from soils is 3.0E-03. for ingestion and 1.8E-02 for dermal contact.

Surface water exposure cancer risks from dermal contact through bathing or showering is 9.6E-06

The estimate for excess cancer risks from ingestion of biota is 1.2E-04, based on based on biota chemical concentrations that are presented in Chapter 6 of the MOTCO EA.

Noncancer Health Effects:

To assess noncancer health effects, a comparison is made by dividing the computed dose by the appropriate reference dose (i.e., RfD). The resulting calculation is termed a "Hazard Index". Hazard Indices are representative of the "margin of safety" that exists between a human

6.4 EXPOSURE ANALYSIS

Potential human doses are estimated from the concentrations of indicator contaminants measured or predicted to occur at the receptors defined earlier in this document. The community may be exposed to environmental pollutants through three primary routes: inhalation, ingestion, and dermal contact. The significance of any of these exposures depends on the current and future land uses in the area, the potential pathways of exposure, and the inherent properties of the chemicals of concern. Table 2 provides a summary of affected media across the exposure pathways at the MOTCO Site.

6.5 RESULTS OF HUMAN DOSE ESTIMATION

Human daily intake values (doses) were calculated for each route of exposure of concern for each chemical detected in a particular environmental medium and are presented in Appendix E of Volume 2 of the MOTCO Endangerment Assessment. These values were used in the risk characterization to estimate potential adverse health effects associated with the residential exposure scenario. Doses were calculated based on the set of assumptions listed in the MOTCO Endangerment Assessment document.

6.6 RISK CHARACTERIZATION

It is in the risk characterization that data specific to the site, indicator chemicals, land use and population, and pathways and routes of exposure are used to assess the risk to the actual and potential receptors. Three separate exposure scenarios were defined for risk characterization: current conditions, future conditions and the residential scenario. Both current and future (predicted) conditions evaluated in the Exposure Assessment for receptors at the MOTCO site are compared to regulatory criteria or a derived Health-Based Number (HBN). For drinking water, available Maximum Contaminant Levels (MCL's) were used. If an MCL was not avilable, the Ambient Water Quality Criteria (AWQC) for the protection of human health was used. Regulatory criteria used for biotic receptors were either Texas Water Commission suggested values, or Federal marine (chronic) toxicity values. For process water, HBN's were derived for OSHA or ACGIH occupational exposure limits.

Excess lifetime cancer risks are determined by multiplying the intake level with the cancer potency factor. These risks are probabilities that are generally expressed in scientific notation (e.g., 1x10-6). An excess lifetime cancer risk of 1x10-6 indicates that, as a plausible upper bound, an individual has a one in one million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at a site.

6.6.1 CURRENT CONDITIONS:

Maximum concentrations of indicator chemicals detected in UC-3 are compared in Table 19 to MCL's, AWQC, or a derived HBN for drinking water. Vinyl chloride (340x), 1,1-dichloroethylene (13x), 1,2-dichloroethane (100x), bis(2-chloroethyl)ether (167x), and benzene (7x) exceed screeing criteria. Of the metals, only lead equaled its MCL and exceeded its proposed MCL for drinking water.

Current maximum and mean concentrations of indicator chemicals in surface water were compared to either Texas Water Commission or Federal marine toxicity criteria. Only the maximum concentration for copper exceeds its marine toxicity criterion.

Water quality for the two process water wells were compared to the HBN's for process water. No chemical concentrations exceeded their respective HBN's derived for process water use.

Biota sampling downgradient from the site was conducted to characterize the potential for aquatic exposure to the indicator list. The results were discussed earlier in this document under the Exposure Assessment Section. Soil and sediment exposures are addressed under the residential scenario, as well.

6.6.2 FUTURE CONDITIONS

In modeling chemical migration in UC-3 from OCW-1 to a hypothetical well near the MOTCO site boundary (HW-1), maximum predicted concentrations in this well, assuming no decay, would exceed drinking water screening criteria for vinyl chloride (215x), 1,1-dichloroethylene (7.4x), 1,2-dichloroethane (62x), bis(2-chloroethyl)ether (10x), and benzene (3.6x).

Predicted maximum concentrations for indicator chemicals in HW-2 (screened across UC-1,UC-2, & UC-3, modeled from the transmissive zone) are compared to drinking water screening criteria. Assuming no decay, criteria would be exceeded for vinyl chloride (155x), 1,2-dichloroethane (1283x), 1,1-dichloroethylene (3.6x), 1,1,2-trichloroethane (1647x), bis(2-chloroethyl) ether (72,700x), and benzene (79x). The time to reach these criteria would be about 500 years.

According to the model, no marine toxicity-derived criteria would be exceeded as a result of lateral migration of contamination from the Transmissive Zone to the Dispose-All pond.

Ground water migration of indicator chemicals from the transmissive zone to the two industrial wells was modeled to predict maximum concentrations in these wells. According to the model results, the HBN's for occupational exposures would not be exceeded in either of the industrial wells.

Soils and ditch sediments are discussed in the residential scenario in this section.

6.6.3 RESIDENTIAL EXPOSURE SCENARIO

For this scenario, it was assumed that a hypothetical resident living at the edge of the site obtained drinking water from HW-1 or HW-2, consumed a predetermined quantity of soil, sediments, and biota per day, and had dermal contact with water, soils, and ditch sediments. Figure 10 provides an illustration of the MOTCO Site sources, pathways, and receptors used in the model.

Cancer Risks:

The principal assumption for ground water pathway is that exposure may occur through ingestion of drinking water or from dermal contact during showering or bathing from either of the two hypothetical wells. The estimate for total cancer risks from ingestion of ground water at HW-1 is 33,000 in a million (3.3E-02) and 120,000 in a million (1.2E-01) at HW-2. For dermal contact, the total cancer risks at HW-1 is 70 in a million (7.0E-05), and 480 in a million (4.8E-04) at HW-2.

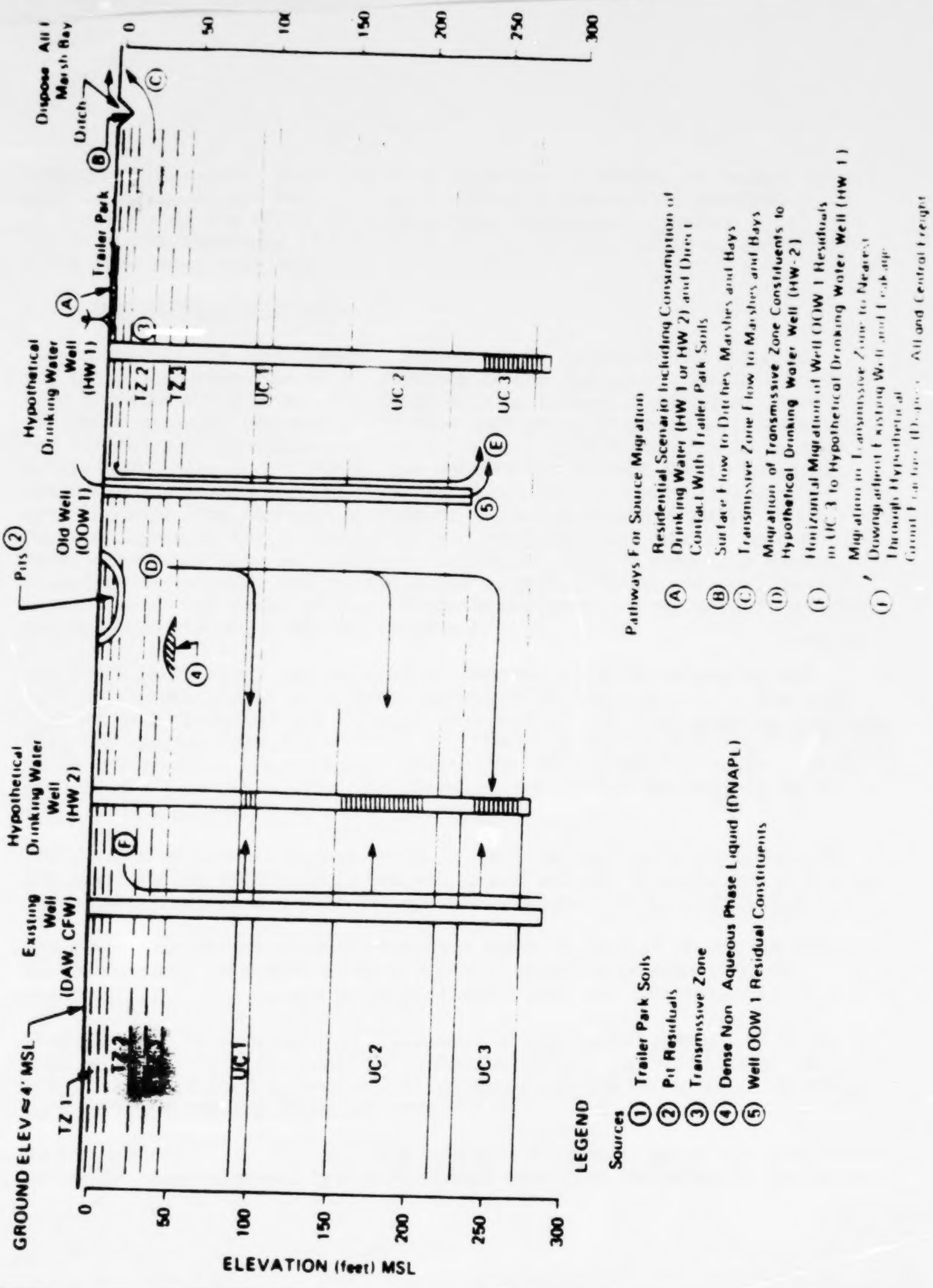
The excess individual cancer risks estimated for occasional dermal (recreational) contact and ingestion of off-site sediments is 44 in a million (4.4E-05). Exposure to trailer park soils may also occur through ingestion and dermal contact. The estimate of total cancer risks from soils is 3,000 in a million (3.0E-03) for ingestion, and 18,000 in a million (1.8E-02) for dermal contact.

Surface water exposure cancer risks from dermal contact through bathing or showering is 96 in a million (9.6E-06).

The estimate for excess cancer risks from ingestion of biota is 120 million (1.2E-04), based on based on biota chemical concentrations that are presented in Chapter 6 of the MOTCO EA.

Noncancer Health Effects:

To assess noncancer health effects, a comparison is made by dividing the computed dose by the appropriate reference dose (i.e., RfD). The resulting calculation is termed a "Hazard Index". Hazard Indices are representative of the "margin of safety" that exists between a human


GROUND ELEV ≈ 4' MSL
TZ 1
TZ 2
TZ 3
UC 1
UC 2
UC 3
Existing Well (DAW, CFW)
Hypothetical Drinking Water Well (HW 2)
Pits ②
Old Well (OOW 1)
Hypothetical Drinking Water Well (HW 1)
Trailer Park
Ditch
Dispose All / Marsh Bay
A
B
C
D
E
F
①
③
④
⑤
0
50
100
150
200
250
300
ELEVATION (feet) MSL
LEGEND
Sources
① Trailer Park Soils
② Pit Residuals
③ Transmissive Zone
④ Dense Non Aqueous Phase Liquid (DNAPL)
⑤ Well OOW 1 Residual Constituents
Pathways For Source Migration
Ⓐ Residential Scenario Including Consumption of Drinking Water (HW 1 or HW 2) and Direct Contact With Trailer Park Soils
Ⓑ Surface Flow to Ditches, Marshes and Bays
Ⓒ Transmissive Zone Flow to Marshes and Bays
Ⓓ Migration of Transmissive Zone Constituents to Hypothetical Drinking Water Well (HW-2)
Ⓔ Horizontal Migration of Well OOW 1 Residuals in UC 3 to Hypothetical Drinking Water Well (HW 1)
Ⓕ Migration in Transmissive Zone to Nearest Downgradient Existing Well and Leakage Through Hypothetical Gravel Fracture (Dispose All and Central Freight

Project No 86C5653	MOTCO Respondents	MOTCO SITE SOURCES, PATHWAYS AND RECEPTORS	Figure
Woodward-Clyde Consultants			

Figure 10

dose and the toxicity potential of a chemical. A summary of Hazard Indices summed across media for each indicator chemical is provided in Chapter 9 of the MOTCO MOM Endangerment Assessment. Tables 3, 4 and 5 provide summaries of non-cancer health effects and total cancer risks from worst case exposures for all media.

6.7 ENVIRONMENTAL ASSESSMENT

The purpose of the environmental assessment is to assess the potential for biological resources to be affected by the indicator chemicals identified from the MOTCO site. The study area is located downgradient from the MOTCO site and represents the area that could be potentially be affected if indicator chemicals migrate off site. This study area is bounded by the MOTCO site to the north, the western end of West Bay to the area between Snake Island and the Brazoria County-Harris County line on the mainland side, the northern portion of Galveston Island adjacent to West Bay and Galveston Bay to the south, and the Texas City channel to the east. The study area included open bay water, shallow estuarine waters, dredge-spoil islands, and natural islands, oyster reefs, marshes, bayous, upland areas, and areas of rural urban development. A detailed discussion can be found the MOTCO MOM EA, chapter 8.

The MOTCO biota study was designed to document existing levels of the indicator chemicals in selected biota occurring near the site. The same species were collected and analyzed from each of the five sampling stations. Only two species were collected at all five stations in sufficient quantity to be analyzed for the indicator chemicals: blue crabs and mullet. Both species are found throughout the Galveston Bay system and exhibit daily and seasonal migration movement patterns.

The pattern of concentrations found in the blue crab and striped mullet did not show any relationship between upgradient and downgradient stations. Therefore, these data appear to represent regional background values.

The concentrations of organic chemicals found in tissues do not appear to be significant. The more soluble organic chemicals generally do not bioaccumulate. The common phthalates are common lab contaminants.

Three species of state-listed threatened or endangered species of birds nest in the study area (Least Tern, Reddish Egret, and White Faced Ibis) and a number of bird rookeries are found through the study area. However, none of these nesting sites are near the MOTCO site.

In conclusion, it is unlikely that appreciable quantities of the chemicals of concern have migrated off-site towards sensitive receptors in Galveston

SUMMARY OF NON-CANCER HEALTH EFFECTS (HAZARD INDEX) FROM WORST-CASE EXPOSURES TO OFF-SITE SURFACE SOILS, SEDIMENTS, BIOTA, AND WATER SOURCES

ASSUMPTIONS: NO DECAY IN GROUNDWATER AND SURFACE WATER
MAXIMUM CONCENTRATIONS FOR SOILS, SEDIMENTS, AND BIOTA

Chemical[1]	Groundwater[2] HW-1[5]	HW-2[6]	Surface Water	Trailer Park Soils[3]	Sediments	Biota	Cumulative Exposures
Barium	1.4E-01	6.5E-03	2.5E-04	5.2E-01	4.0E-04	5.4E-04	0.66E+00
Cadmium	ND	1.0E-02	ND	ND	3.4E-04	ND	1.0E-02
Carbon Disulfide	ND	7.7E-05	ND	4.2E-04	ND	ND	5.0E-04
Chromium (VI & III)	5.5E-02	4.8E-03	ND	8.2E-02	3.8E-03	4.9E-03	1.8E-01
Copper	6.3E-03	4.8E-04	2.2E-05	5.1E-02	1.2E-03	1.4E-02	7.2E-02
1,1-Dichloroethylene	1.8E-01	8.6E-02	2.3E-07	6.0E-03	ND	ND	2.7E-01
Lead	1.1E+00	1.2E-02	7.3E-05	6.0E-01	3.2E-02	1.5E-02	1.8E+00
Mercury	1.9E-03	NC	ND	3.5E-03	6.5E-05	ND	5.4E-03
Naphthalene	3.8E-04	4.9E-02	1.3E-07	1.5E-01	ND	ND	2.0E-01
Selenium	2.2E-02	7.5E-04	ND	ND	ND	8.2E-04	2.2E-02

[1] Chemical list includes those chemicals for which a Hazard Index could be calculated based on the availabiltiy of a Reference Dose and a calculated human daily dose. Hazard Index is defined as Human Dose/Reference Dose.

[2] Groundwater exposure includes ingestion plus dermal.

[3] Trailer park soils exposure includes ingestion plus dermal.

[4] Sediments exposure includes ingestion plus dermal.

[5] Hypothetical drinking water well screened in UC-3 with OOW-1 as the source.

[6] Hypothetical drinking water well screened across UC-1, UC-2, and UC-3 with the Transmissive Zone as the source.

ND = Not detected
NC = Mean concentration of indicator chemical below background concentrations.

Table 3

SUMMARY OF TOTAL CANCER RISKS FROM WORST-CASE EXPOSURE TO OFF-SITE SURFACE SOILS, SEDIMENTS, AND WATER SOURCES

ASSUMPTIONS: NO DECAY IN GROUNDWATER AND SURFACE WATER
DRINKING WATER WELL HW-1[1]
MAXIMUM CONCENTRATIONS FOR SOILS AND SEDIMENTS

Route of Exposure	Groundwater No Decay Concentration[2]	Surface Water No Decay Concentration[2]	Off-Site Sediment Maximum Concentration[3]	Trailer Park Soil Maximum Concentration	Total
Ingestion	3.3E-02	NA	2.9E-05	3.0E-03	3.6E-02
Dermal	7.0E-05	9.6E-06[4]	1.5E-05	1.8E-02	1.8E-02
Total	3.3E-02	9.6E-06	4.4E-05	2.1E-02	5.4E-02

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[1] Hypothetical drinking water well, screened in UC-3 with OOW-1 as the source.

[2] When modeling results were not available for a given compound (e.g., some metals), the maximum currently detected concentration was used under the worst-case exposure conditions.

[3] Cancer risks are expressed as excess individual cancer risks (see Section 7).

[4] Exposure to off-site surface water includes dermal contact with and inadvertent ingestion of chemical constituents.

NA Not appropriate

Table 4

SUMMARY OF TOTAL CANCER RISKS FROM WORST-CASE EXPOSURE TO OFF-SITE SURFACE SOILS, SEDIMENTS, AND WATER SOURCES

ASSUMPTIONS: NO DECAY IN GROUNDWATER AND SURFACE WATER
DRINKING WATER WELL HW-2[1]
MAXIMUM CONCENTRATIONS FOR SOILS AND SEDIMENTS

Route of Exposure	Groundwater No Decay Concentration[2]	Surface Water No Decay Concentration[2]	Off-Site Sediment Maximum Concentration[3]	Trailer Park Soil Maximum Concentration	Total
Ingestion	1.2E-01	NA	2.9E-05	3.0E-03	1.2E-01
Dermal	4.8E-04	9.6E-06[4]	1.5E-05	1.8E-02	1.9E-02
Total	1.2E-01	9.6E-06	4.4E-05	2.1E-02	1.4E-01

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[1] Hypothetical drinking water well, screened across UC-1, UC-2, and UC-3 with the Transmissive Zone as the source.

[2] When modeling results were not available for a given compound (e.g., some metals), the maximum currently detected concentration was used under the worst-case exposure conditions.

[3] Cancer risks are expressed as excess individual cancer risks (see Section 7).

[4] Exposure to off-site surface water includes dermal contact with and inadvertent ingestion of chemical constituents.

NA Not appropriate

Table 5

2. ACTION-SPECIFIC REQUIREMENTS

FEDERAL

Prevention of Significant Deterioration of Air Quality 42 U.S.C. § 7475 40 C.F.R. § 52.21	No	These provisions impose various requirements (e.g. use of best available control technology) on any new major stationary source of a federally regulated air pollutant in an area which has been designated attainment or unclassifiable for that pollutant. A "major stationary source" is a source listed in 40 C.F.R. § 52.21 which emits, or has the potential to emit, 100 tons per year of a federally regulated air pollutant or any non-listed source that emits, or has the potential to emit, 250 tons per year of a federally regulated air pollutant. The treatment systems to be used during remediation will not constitute a major stationary source of any federally regulated air pollutant. Thus, this requirement is not an ARAR.
Nonattainment Areas - LAER 42 U.S.C. § 172(b)(6) and § 173	No	A state's permit program under the federal Clean Air Act must require permits for the construction and operation of new major stationary sources in NAAQS nonattainment areas. Such a permit may be issued only if the proposed source complies with "lowest achievable emission rate" requirements. Galveston County is nonattainment for ozone. However, the treatment systems to be used during remediation are not "major stationary sources." Therefore, this requirement is not an ARAR. The requirement is also not an ARAR since the expected volume of VOC emissions would not significantly alter ambient ozone concentrations.
New Source Performance Standard for Incinerators 40 C.F.R. Part 60 Subpart E	No	Sets a limit for particulate emissions of 0.18g/dscm (0.08 gr/dscf) corrected to 12% CO_2. Not an ARAR since applies to furnaces burning over 50% municipal waste (to reduce its volume) at more than a 45 metric tons/day (50 tons/day) charging rate.
Hazardous Waste Incinerators 40 C.F.R. Part 264, Subpart O	Yes	Pertains to incinerators used to burn hazardous waste; serves as an ARAR to extent affected materials exhibit hazardous constituent characteristics similar to listed hazardous wastes.

Waste Analysis § 264.341, § 270.62(b)(2)	Yes	These waste analysis requirements involve administrative requirements. However, they assure compliance with incinerator performance standards. Minus their administrative aspects, these regulations require waste analyses (1) before a trial burn, to determine the heat value and viscosity of the affected material, and the identity and concentration of constituents reasonably expected to be found in the affected material, and (2) during the operation of the incinerator, to verify that the waste feed is within physical and chemical composition limits necessary to achieving performance standards.
Performance Standards § 264.343	Yes	Requires an incinerator to be designed, constructed and maintained so that, when operating, the incinerator: (1) achieves a destruction and removal efficiency of 99.99% for each principal organic hazardous constituent in the waste feed, (2) controls HCL emissions to not exceed the greater of 1.8 kg/hr or 1% of the HCL in the stack gas entering pollution control equipment, and (3) control particulate emissions to not exceed .08 grains/dscf (corrected for oxygen in the stack gas).
Trial Burn § 264.344 and § 270.62(b)(6)	Yes	Trial burn required to establish operating parameters necessary to meet performance standards. During trial burn, any sources of fugitive emissions must be identified, and temperatures (average, maximum and minimum), combustion gas velocity, and carbon monoxide in the exhaust gas must be measured.
Start-up/Shut-down § 264.345(c)	Yes	During start-up and shut-down, affected material must not be fed into the incinerator unless the incinerator is operating within the parameters (temperature, air feed rate, etc.) set as being necessary to meet performance standards.
Fugitive Emissions Control § 264.345(d)	Yes	Fugitive emissions from the combustion zone must be controlled by (1) keeping the combustion zone totally sealed against fugitive emissions, or (2) maintaining a combustion zone pressure lower than atmospheric pressure, or (3) an alternate means of control equivalent to maintaining combustion zone pressure lower than atmospheric pressure.

Monitoring § 264.347(a)	Yes	While incinerating affected materials, combustion temperature, material feed rate, an indicator of combustion gas velocity, and carbon monoxide (at a point downstream of the combustion zone and prior to release to the atmosphere) must be continuously monitored.
Automatic Cut Off § 264.345(e)-(f)	Yes	An automatic cut off system must be used to stop feed of affected materials into the incinerator when operating conditions deviate from operating parameters.
Closure § 264.351	Yes	At closure, the owner or operator must remove any hazardous waste and hazardous waste residues (including, but not limited to, ash, scrubber wastes, and scrubber sludges) from the incinerator site.
State		
Control of Air Pollution for New Construction-BACT 31 Tex. Admin. Code § 116.3(a)(2)-(3)	Yes	New non-exempt facilities which may emit air pollutants must obtain a construction permit or special permit. To obtain such a permit, the owner or operator of the proposed facility must provide for measuring emissions of significant air contaminants and must demonstrate, among other things, that the facility will utilize the "best available control technology, with consideration given to the technical practicability and economic reasonableness of reducing or eliminating the emissions from the facility." While permitting requirements are not applicable to on-site remedial activities, the requirement of utilizing best available control technology serves as an ARAR for an incinerator or other treatment systems to be used during remediation. Note, however, that BACT would not be an ARAR to certain air stripper emissions as TACB has granted a standard exemption for steam, air and inert gas stripping systems where a) emissions (except nitrogen, CO_2, air, O_2 and H_2O vapor) do not exceed 5 lbs/hour or b) the stripped gas and vapors are burned in a combustion device meeting the 5lb/hour standard (operated at 20% excess air, .5 second retention time, 1400° F) or c) the emissions of other compounds meet TACB standard exemption 118(b)(c) and (d)

Control of Air Pollution for New Construction-LAER 31 T.A.C. §116.3(a)(8)	No	Galveston county is nonattainment for ozone. To obtain a construction permit in an ozone nonattainment county for a new facility which is a major stationary source [i.e., has the potential to emit 100 tons/year of volatile organic compound emissions (31 T.A.C. § 101)], the owner or operator must demonstrate that the proposed facility will comply with "lowest achievable emissions rate" (LAER) requirements. This requirement is not an ARAR since the treatment systems or incinerator to be used during remediation will not be a "major stationary source" of VOCs. The requirement is also not an ARAR since the expected volume of VOC emissions would not significantly alter ambient ozone concentrations.
Opacity Criteria 31 T.A.C. § 111.21	Yes	Visible emissions from a stationary flue (e.g., incinerator stack) must not exceed an opacity of 20% averaged over a 5-minute period. Visible emissions from the cleaning of a firebox or the building of a new fire, sootblowing, equipment changes, ash removal, and rapping of precipitators may exceed this opacity limit for a period aggregating not more than 5 minutes in any 60 consecutive minutes, nor more than 6 hours in any 10-day period. Contributions from uncombined water are not to be considered in determining compliance. 31 T.A.C. § 111.27.
Opacity Criteria 31 T.A.C. § 111.26	No	Visible emissions from a stationary flue with a total flow rate of 100,000 acfm or more must not exceed an opacity of 15% averaged over a 5-minute period, unless an optical instrument capable of measuring the opacity of emissions is installed in the flue. Measurements must be recorded. The provision will not apply to flues having gas streams containing moisture which interferes with proper instrument operation. Contributions from uncombined water are not to be considered in determining compliance. 31 T.A.C. § 111.27. This provision is not an ARAR as the anticipated flow rate from a stationary flue is not expected to exceed 75,000 acfm and the flue gas stream will contain a high amount of moisture which would interfere with operating opacity measurement equipment.
Road Particulates 31 T.A.C. § 111.44	No	Prescribes measures to be taken to control dust from roadways in areas that are nonattainment for particulates [31 T.A.C. § 111.41 limits applicability to nonattainment areas.] This requirement is not an ARAR as Galveston County is attainment for particulates.

Particulates 31 T.A.C. § 111.51	Yes	Particulate emission limits are specified based on effluent flow rates (acfm) and standard stack heights. Extrapolation from specified emission limits (assuming specified stack heights) is according to the equation $E = 0.048q^{0.62}$ where E is the allowable emission rate in lb/hr and q is the stack effluent flow rate in acfm. If a source has an effective stack height less than the specified standard effective height for a certain effluent flow rate, the regulation also requires reduction in the allowable emission level according to a specified formula. Not an ARAR for steam generators subject to 31 T.A.C. § 111.53.
Particulates from Steam Generators 31 T.A.C. § 111.53	**No**	Particulate **emissions from** a solid fossil fuel-fired **steam** generator **must** not exceed 0.3 pounds per **million** Btu heat input **maximum** 2-hour average. Particulate **emissions from** an oil or gas fuel-fired **steam** generator with a heat input greater than 2,500 **million** Btu per hour **must** not exceed 0.1 pound per **million** Btu input **maximum** 2-hour average. This requirement is not an ARAR, as no solid fossil fuel-fired **steam** generator, nor any oil or gas fuel-fired **steam** generator with a heat input greater than 2,500 **million** Btu per hour will be used in **remediation**. Also, not an ARAR since **limits** are established for particular technologies and particular fuels which won't be present at site.
SO_2 from Solid Fuel Steam Generator 31 T.A.C. § 112.5	**No**	Specifies allowable SO_2 **emissions from** a solid fossil fuel **steam** generator. As no such unit will be used, and **limit** is established for a particular technology and particular fuel which won't be present at the site, this standard is not an ARAR.
SO_2 from Liquid Fuel Steam Generator 31 T.A.C. § 112.6	**No**	Specifies allowable SO_2 **emissions from** liquid fuel-fired **steam** generator. Since no such unit will be used, this standard is not an ARAR. Also not an ARAR since **limit** established for particular technology and particular fuel which will not be present at the site.
VOC Storage 31 T.A.C. § 115.101	**No**	Specifically applicable in Galveston County. VOCs with a true vapor pressure equal to or greater than 1.5 psia (10.3 kPa) **must** be stored in containers capable of **maintaining** a working pressure sufficient at all **times** to prevent any vapor or gas loss to the **atmosphere**, or equipped with a vapor recovery **system** or other control device specified in the regulation. No such VOC storage will occur during any **remedial** alternative.

MOTCO - MANAGEMENT OF MIGRATION TABLE (Cont'd)

VOC Water Separator 31 T.A.C. § 115.141	**No**	These requirements apply to a VOC water separator which handles 200 gallons or more per day of VOCs with a true vapor pressure equal to or greater than 1.5 psia (10.3 kPa) in a single compartment of the separator. No such VOC water separator is anticipated to be used in any remedial alternative.
Vent Gas Streams 31 T.A.C. § 115.162	**Yes**	This regulation requires controls for emitting vent gas streams containing VOCs from process vents. Thereunder, the vent gas stream must be burned at 1300°F (704°C) or more in a smokeless flare or a direct-flame incinerator before entering the atmosphere.
Cold Solvent Cleaning 31 T.A.C. § 115.172	**Yes**	If a cold solvent parts washer is used, then this would be an ARAR. This regulation contains detailed requirements for a cover, a cleaned-parts drainage facility, a directions label, solvent spray, and freeboard or water cover, as well as specific operating requirements.
Hotwells 31 T.A.C. § 115.152(b)	**No**	Limits VOC emissions from hotwells. Not an ARAR as no hotwells are to be utilized in management of migration operable unit.

TABLE 9
APPLICABLE OR RELEVANT AND
APPROPRIATE REQUIREMENTS FOR SURFACE WATER PATHWAYS

MOTCO - MANAGEMENT OF MIGRATION

SURFACE WATER PATHWAY
MANAGEMENT OF MIGRATION

REQUIREMENT	ARAR?	JUSTIFICATION
1. CONTAMINANT SPECIFIC ARARs		
Safe Drinking Water Act 40 U.S.C. 300 Primary Drinking Water Standards (MCL) 40 C.F.R. Part 141	No	No extensive surface waters exist around site and such waters are not currently used for drinking water or designated for public and private water supply. Not an ARAR as surface waters are unlikely to be used for drinking water in the future due to salinity
Secondary Drinking Water Standards 40 C.F.R. Part 143	No	No public drinking water supply systems currently exist near site. Not an ARAR as surface water is unlikely to be utilized as source of drinking water due to salinity.
Maximum Contaminant Level Goals (MCLG) 40 C.F.R. § 141.50	No	Not an ARAR as MCLGs are set at levels that do not take into account cost or feasibility. See 52 Fed. Reg. 32499. Further, surface waters are unlikely to be utilized as a source of drinking water due to salinity.
Federal Clean Water Act Water Quality Criteria 40 C.F.R. Part 131 Quality Criteria for Water, 1976, 1980 and 1986	No	Not an ARAR as Texas had adopted water quality standards which are based on the federal water quality criteria. Numerical criteria have been established based on Texas water quality standards. See Page 4, intra and Management of Migration "To Be Considered" Table
Toxic Pollutant Effluent Standards 40 C.F.R. Part 129	No	Standards pertain only to point source discharges to navigable waters from specified facilities that discharge aldrin/dieldrin, DDT, endrin, toxaphene, benzidine, PCB's. Not an ARAR is none of the listed pollutants will be present in the discharge

TABLE (Cont'd)

MOTCO - MANAGEMENT OF MIGRATION

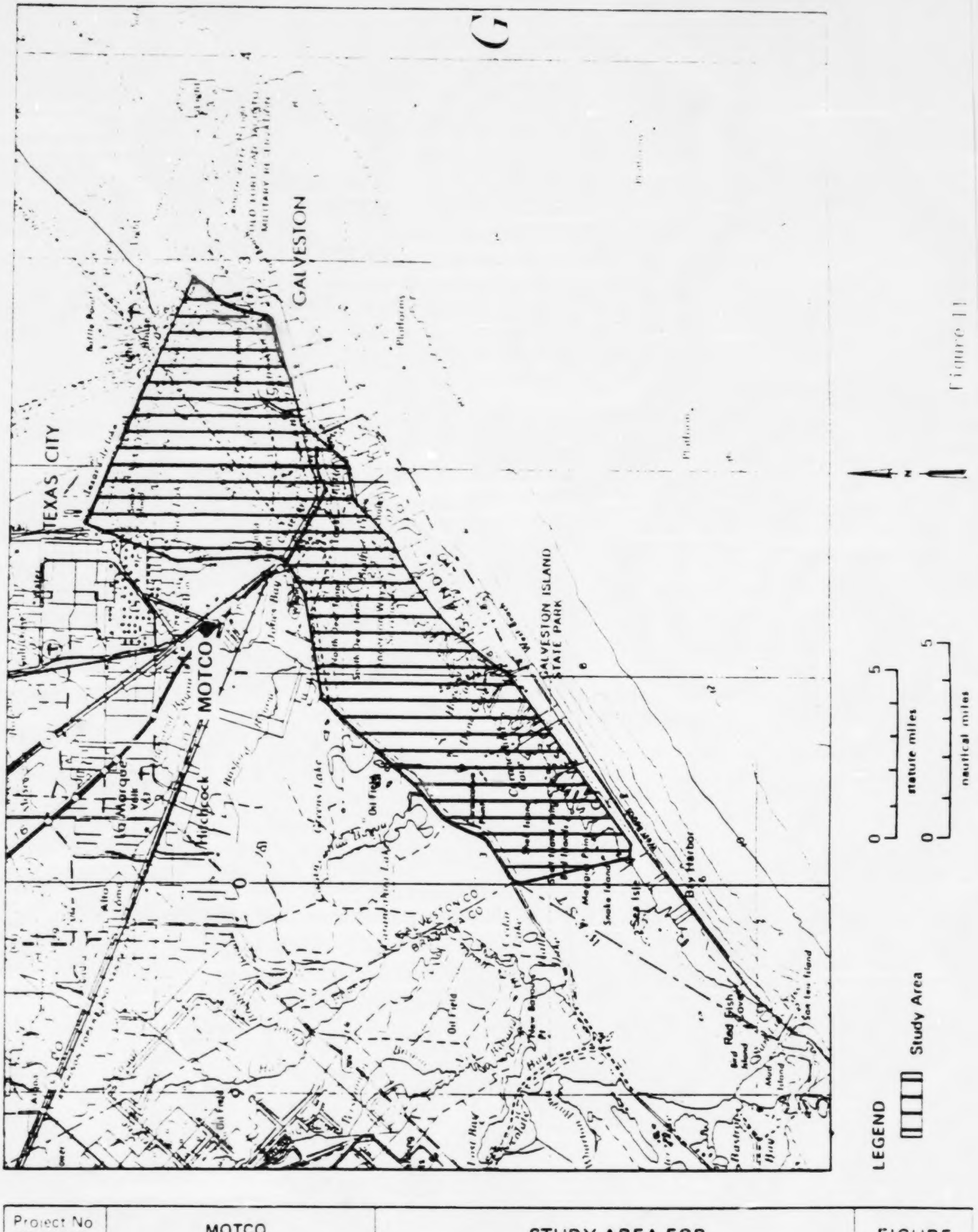
Hazardous Substances 40 C.F.R. § 116.3 and 116.4	No	Establishes reporting requirements for certain discharges of reportable quantities of hazardous substances. Creates no substantive clean up requirement.
Texas Department of Health Drinking Water Standards Maximum Allowable Levels 25 T.A.C. Chapter 337	No	Surface waters around site are not utilized for public drinking water supply. Not an ARAR as surface waters not likely to be utilized for drinking water supply due to existing natural water quality.
Texas Recommended Secondary Constituent Levels 25 T.A.C. § 337.14	No	Prohibits "source of supply" which does not meet standards from being used by public water supply system. Not an ARAR as surface waters do not serve as source of supply for drinking water. In addition not an ARAR as waters are not likely to be used as source of such supply due to existing natural water quality.
Pollution Prohibition Texas Water Code § 26.121	Yes	Prohibits the discharge of wastes into or adjacent to any natural or artificial bodies of surface water, inland or coastal, which in itself or in conjunction with any other discharge or activity, causes or will cause pollution of the surface water.
Texas Surface Water Quality Standards 31 Tex. Admin. Code § 307		
Aesthetics 31 T.A.C. § 307.4(b)(1)	Yes	General prohibition of concentrations in surface water of taste and odor producing substances which impart unpalatable flavor to foodfish including shellfish, or otherwise interfere with the reasonable use of the water in the state. Not ARAR to extent wastewater discharges to POTW.
General Toxicity 31 T.A.C. § 307.4(d)	Yes	Surface waters must not be toxic to man or to terrestrial or aquatic life. Not ARAR to extent wastewater discharges to POTW.

TABLE (Cont'd)

MOTCO - MANAGEMENT OF MIGRATION

Antidegradation 31 T.A.C. § 307.5	No	This policy applies to actions that would increase pollutant loads to the water in the state. These actions are those related to man-induced nonpoint sources of pollution which may impact water in the state.
Acute Toxicity 31 T.A.C. § 307(b)(1)	Yes	Surface water must not be acutely toxic to aquatic life (except in small zones of initial dilution at discharge points). Not ARAR to extent wastewater is discharged to POTW.
Chronic Toxicity 31 T.A.C. § 307.6(b)(2)	Yes	Surface water with designated or existing aquatic life uses shall not be chronically toxic to aquatic life (except in mixing zones and below critical low-flow conditions). Not ARAR to extent wastewater is discharged to POTW.
Human Toxicity 31 T.A.C. § 307.6(b)(3)	Yes	Surface water must be maintained to preclude adverse toxic effects on human health resulting from contact recreation, consumption of aquatic organisms, or consumption of drinking water after reasonable treatment. This regulation is not an ARAR to the extent that it pertains to drinking water, as surface water in the area is not a potential source of drinking water. Not ARAR to extent wastewater is discharged to POTW.
Numerical Criteria for Toxics 31 T.A.C. § 307.6(c)	Yes	Numerical criteria have been established by the Texas Water Commission for the following indicator chemicals at the MOTCO site. Units are ug/l unless otherwise indicated:

	Fresh Acute Criteria	Fresh Chronic Criteria	Marine Acute Criteria	Marine Chronic Criteria
Arsenic	360	190	149	78
Cadmium	$e^{(1.28[\ln(\text{hardness})-1.6774)}$	$e^{(0.7852[\ln(\text{hardness})]-3.490)}$	45.62	10.02
Chromium (III)	$e^{(0.8190[\ln(\text{hardness})]+3.688)}$	$e^{(0.8190[\ln(\text{hardness})]+1.561)}$		


GALVESTON
TEXAS CITY
MOTCO
Hitchcock
La Marque
GALVESTON ISLAND STATE PARK
Bay Harbor
GALVESTON CO
BRAZORIA CO
Oil Field
Platform
LEGEND
Study Area
statute miles
nautical miles
0
5
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5
N

Figure 11

Project No 86C5653	MOTCO	STUDY AREA FOR MOTCO ENVIRONMENTAL ASSESSMENT	FIGURE
Woodward-Clyde Consultants			

Bay or Jones Bay. This conclusion is based on ground water modeling and the results of the biota study.

6.8 SUMMARY OF SITE RISKS DECLARATION

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision document, may present an imminent and substantial endangerment to public health, welfare, or the environment.

7. DESCRIPTIONS OF ALTERNATIVES

The MOTCO Feasibility Study developed six alternatives to evaluate for the Management of Migration Remedial Action. In addition to the alternatives outlined below, EPA evaluated the cost to excavate and incinerate material to a depth of 50 feet on the primary MOTCO site and the area adjacent to it. It was determined that this alternative was not viable for further consideration due to the following areas of concern: Risk in excavating to 50 feet, longer than eight years to incinerate material, water control at time of excavation was a major concern, perception by the public that it would be a permanent facility, and the high cost to implement (+ $400 Million dollars).

7.1 NO ACTION: Alternative A

In this alternative, no action would be taken to control the migration of contaminants from the MOTCO site. The actual and potential site hazards would not be reduced. This alternative is required under Superfund law as a baseline for comparing other remedial alternatives.

7.2 INSTITUTIONAL CONTROLS: Alternative B

This alternative would add additional institutional controls to those controls already planned for the Source Control remedial action. The major components of Alternative B are as follows:

1. Enact and record deed restrictions or notices legally prohibiting all land development, recreational use, and ground water development within the site boundaries.

2. Install new security fencing along the HL&P right-of-way west of the MOTCO site and on the Highway right-of-way generally south of the site. This would add about 2200 feet of fencing to the fencing already planned during the Source Control remedial action.

3. Implement a ground water compliance monitoring program by installing six wells each in the Transmissive Zone aquifer, and the Upper Chicot Aquifer Zones 1,2, and 3. Three monitoring wells would also be installed in the clay unit above the UC-1 aquifer. Upper Chicot clay to be protected to one half of MCLs, Upper Chicot Aquifer protected to MCL's.

4. Conduct quarterly monitoring and inspection of the components of this remedial action.

7.3 CONTAINMENT: Alternative C

1. Enact and record deed restrictions or notices legally prohibiting all land development, recreational use, and ground water development within the site boundaries.

2. Install new security fencing along the Highway right-of-way generally south of the site. This would add about 800 feet of fencing to the fencing already planned during the Source Control remedial action.

3. Implement a ground water compliance monitoring program by installing wells in each of the Transmissive Zone aquifers, and in the UC-1, UC-2, and UC-3 Aquifers. Monitoring wells would also be installed in the clay unit above the UC-1 Aquifer.

4. Remove and treat contaminated ground water in the UC-3 Aquifer. After pretreatment of this water by an onsite liquids treatment plant the water could then be discharged to a POTW or treated to discharge standards onsite. (MCL's are cleanup standard for Upper Chicot). Treat to HBN's in TZ.

5. Install a slurry cutoff wall to contain the dense organic liquids (DNAPL's) and contaminated ground water in the Transmissive Zones. The slurry wall would be about 50 feet deep and 2300 feet long.

6. Install wells in the Transmissive Zone to recover dense organic liquids and contaminated ground water outside the slurry wall. The Transmissive Zone ground water well would be used to control further migration of contaminated ground water in the TZ. The removed dense organic wastes (DNAPL's) and contaminated ground water could then be either pretreated and sent to a POTW or treated onsite to discharge standards. Treat to HBN's in Transmissive Zone Aquifer.

7. Incinerate dense organic liquids removed from the Transmissive Zone.

8. Excavate up to four feet of contaminated soils from the surface areas TPH, TP2, SS1 and SS2 and consolidate these excavated soils at surface area TP1. The consolidated area would be capped with 3 feet of clay and 1 foot of topsoil. The excavated areas would be backfilled with clean material to original grade.

7.4 GROUND WATER TREATMENT & SURFACE SOIL CONSOLIDATION

Alternative D:

1. Enact and record deed restrictions or notices legally prohibiting all land development, recreational use, and ground water development within the site boundaries.

2. Install new security fencing along the Highway right-of-way generally south of the site. This would add about 800 feet of fencing to the fencing already planned during the Source Control remedial action.

3. Implement a ground water compliance program with the installation of observation wells in the Transmissive Zone, wells each in the Upper Chicot Zones UC-1, UC-2, and UC-3. Installation of wells in the clay unit above the Upper Chicot Aquifer UC-1. Should the chemical concentrations exceed one-half of the MCL or appropriate health-based number, a more aggressive pump and treat program shall be implemented in the shallow Transmissive Zone.

4. Remove and treat contaminated ground water in the UC-3 with ground water pumping wells. Recovered contaminated ground water would be treated by the best available technology (B.A.T.) to the applicable or relevant and appropriate State or Federal discharge standard or sent to a permitted wastewater treatment plant.

5. Remove and treat contaminated ground water and dense organic liquids from the Transmissive Zone using pumping wells and injection wells (to assist dense organic liquid removal). These contaminated liquids would be treated by an onsite liquids treatment plant by B.A.T. or sent to a permitted waste water treatment with the treated water either to a POTW or discharged. facility. Remediation of TZ ground water to HBN's.

6. Extraction, to extent feasible, and incineration of the dense organic liquids removed from the Transmissive Zone.

7. Develop a Transmissive Zone ground water pumping system to produce an upward gradient from the Upper Chicot Aquifer to the Transmissive Zone Aquifer.

8. Excavation (to a maximum depth of four feet), consolidation, and onsite containment of contaminated surface soils and sediments from areas TPH, TP2, SS1, and SS2. Soils would be relocated to the TP1 area and capped with three feet of clay and one foot of topsoil and seeded. The excavated areas would be backfilled with clean material to original grade.

7.5 GROUND WATER TREATMENT & SURFACE SOIL INCINERATION
Alternative E:

This alternative employs the same components as Alternative D except that the surface soil excavated from TPH, TP1, TP2, SS1, and SS2 is incinerated either by an onsite Source Control incinerator or by an onsite, mobile hazardous waste incinerator.

7.6 GROUND WATER TREATMENT & SURFACE SOIL BIOREMEDIATION
Alternative F:

This alternative employs the same components as Alternative D except that the surface soil excavated from TPH, TP1, TP2, SS1, and SS2 is bioremediated by an onsite aerobic digestion.

7.7 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The EPA's goal is to select a remedy that provides the "best balance" of tradeoffs with respect to the following nine evaluation criteria:

Threshold Criteria:

1. Overall protection of human health and the environment; and
2. compliance with applicable or relevant and appropriate requirements.

Primary Balancing Criteria:

3. Long-term effectiveness and permanence;
4. reduction of toxicity, mobility, or volume through treatment;

5. short-term effectiveness;

6. implementability; and

7. cost

Modifying Criteria: 8. State/support agency acceptance; and

9. community acceptance.

Table 6 provides an overall cost summary for all of the alternatives evaluted in the MOTCO MOM Feasibility Study.

A summary of the comparative evaluation of the alternatives and the nine criteria is presented in Table 7 in this section of the ROD.

Tables 8 through 12 outline the applicable or relevant and apropriate State and Federal standards that were reviewed during the MOM RI/FS process.

8. THE SELECTED REMEDY

The remedial action alternative selected by the EPA is Alternative D, Ground Water Treatment and Surface Soil Consolidation. The EPA believes that this remedy will achieve the best balance of the nine criteria discussed earlier in this document.

The major components of the selected remedy are as follows:

1. The MOTCO Trust have purchased property adjacent to the site to allow control of contaminated offsite property;

2. implement deed restrictions or notices to prohibit land development and use. At a minimum, as part of the annual monitoring and maintenance of the site, there will be a verification that site conditions have not changed and that there has been no land use or development that may effect the remedial action. If any changes occur, EPA will evaluate the changes and take appropriate action;

3. install additional security fencing to enclose all MOTCO properties;

4. implement ground water compliance monitoring in the Upper Chicot clay unit above the first Upper Chicot Aquifer Zone. Detection of the site's indicator compounds either at one-half the MCL or above a 1 x 10-6 risk level will intiate more agressive ground water and dense organic liquid (DNAPL's) removal operations. The exact number and location of these monitoring points will be addressed during the design phase of the remedy.

Table 6

OVERALL COST SUMMARY FOR ALL ALTERNATIVES***

Site-wide Remedial Alternative	Capital Costs ($)	Annual Cost ($)	Present Worth Cost ($)	Total Present Worth ($)
A	$ -0-	$ 5,000	$ 77,000	$ 77,000
B	423,000	208,000	3,180,000	3,600,000
C	2,910,000	345,000	5,220,000	8,130,000
D	2,690,000	453,000	6,120,000	8,810,000
E1	4,480,000	1,980,000*	8,960,000*	13,400,000*
E2	4,480,000	5,680,000**	15,800,000**	20,300,000**
F	4,480,000	4,370,000	13,400,000	17,900,000

* Alternative E1, Utilizing Existing Source Control Incinerator

** Alternative E2, Utilizing Mobile Incinerator

*** All FS costs are based on a +50% to -30% accuracy range.

Table 7

COMPARATIVE EVALUATION OF ALTERNATIVES

ALTERNATIVES ELEVATION CRITERIA	ALTERNATIVE - A NO ACTION	ALTERNATIVE - B INSTITUTIONAL CONTROL	ALTERNATIVE - C CONTAINMENT	ALTERNATIVE - D TREATMENT AS PRINCIPAL METHOD	ALTERNATIVE - E TREATMENT AS PRINCIPAL METHOD	ALTERNATIVE - F TREATMENT AS PRINCIPAL METHOD
1. Short-term Effectiveness						
- Time Until Protection is Achieved	Natural attenuation is the least preferred alternative for all media. It takes many years to achieve protection.	GW protection is achieved in same period as Alt. A; fencing and deed restriction in Alt. B achieves fastest access control and protection against contact of TP soils, and surface soils.	Better alternative for GW & DNAPLs protection compared to Alt. A and Alt. B but still takes many years; Capping of TP, SS1, SS2 & TPH soils provides protection against dermal contact or ingestion in less than a year	Method involves active extraction and treatment of UC and TZ groundwater plus collection and disposal of DNAPLs wells. Achieves faster protection of groundwater as compared to Alts. B and C; capping of surface and TP soils are comparable to the controls used in Alt. C. GW target levels achieved in 5 years.	Incineration of 17,400 cu yds of TP & TPH soils and capping of TP takes longer period to achieve protection.	Bio treatment of 17,400 cu yd of TP and TPH soils and capping requires more time than Alt. E. GW and surface treatment takes same period as Alts. D. and E.
- Protection of Community During Remedial Action	No community protection against exposure or dermal contact provided under this alternative for all media.	Adequate protection against exposure of limited nearby population provided by fencing and deed restrictions. Better protection compared to Alt. A.	More community protection is required during implementation of this Alt. compared to Alt. B. (during capping, slurry wall construction and gradient reversal extraction well operations). Protection accomplished by fencing.	Fencing and deed restrictions provided. Same level of community protection is required and provided as Alt. C.	Incineration requires additional community protection against air emissions. Protection against GW and affected soil provided are comparable to Alt. B, C and D. Incineration of DNAPLs necesitates additional protection during remediation.	Same level of adequate protection required as Alt. E.
- Protection of Workers During Remedial Action	No remedial action, and hence no protection involved	Minimal risk to workers compared to all alternatives except Alt. A, during fencing and TW sampling.	Risk level higher compared to Alts. A and B, during excavation, relocation and stabilization of TPH soils. Capping of TP soils poses more risk to workers than Alt. B. GW pumping and slurry wall construction entails additional protection to workers.	Same level of risk as Alt. C, and so same level of worker protection required as Alt. C for all media except DNAPLs. DNAPLs' collection and handling for remediation requires additional protection to workers and the public (from accidental spills).	On site incineration of TP soils entails additional risk and hence additional protection to workers. Protection provided for all other media are comparable to Alt. D.	Same level of worker protection as Alt. E required, for extended time period as compared to Alt. E.

Table 7 Cont.

ALTERNATIVES ELEVATION CRITERIA	ALTERNATIVE - A NO ACTION	ALTERNATIVE - B INSTITUTIONAL CONTROL	ALTERNATIVE - C CONTAINMENT	ALTERNATIVE D TREATMENT AS PRINCIPAL METHOD	ALTERNATIVE E TREATMENT AS PRINCIPAL METHOD	ALTERNATIVE F TREATMENT AS PRINCIPAL METHOD
- Environmental Impacts	No action and hence no mitigation of impacts; no additional impacts result from construction activities.	Limited impact to biota during fencing.	Relatively more impacts to biota and ditches as compared to Alt. B., but still limited. Surface soil execavation, relocation and capping creates temporary short-term environmental impact. Slurry-wall construction also creates limited environmental impact.	Same level of impact as Alt. C; Additional gradient wells installation creates more short term environmental impacts as compared to Alt. C.	Same level of impact as Alt. D for all media except air; additional impact created to air media through air emissions during excavation and incineration. Adequate mitigative measures possible by using air emissions control.	Slightly higher level of impact created as compared to Alt. E due to bio treatment process requiring additional space. Impacts created by all other media remains same as Alts. C, D and E. Impacts created is for an extended period as compared to E.
2 Long term Effectiveness						
Magnitude of Residual Risk	Significant and relatively higher levels of risk as compared to all alternatives B thru F exists for all media of concern.	Same level of risk as Alt. A prevails in potable GW beyond site boundaries. Risk from exposure to other media mitigated as compared to Alt. A by restricting access to areas. Risk reduced due to restriction to residential use and groundwater exposure within site boundaries.	Risk associated with potable GW at nearest current user is significantly reduced; risk associated with hypothetical GW user at property line remains; Capping over TP and TPH leaves residual excess cancer risk less than E-06 which is isgnificantly less than Alt. B. Capping of surface soils leaves behind risk level much lower as compared to Alt. B.	Long term risk associated with hypothetical GW user at property line is mitigated more than Alt. C. Agressive collection and disposal of DNAPLs reduces TZ risk level more than Alt. C; risks associated with TP soils and surface soils are similar to Alt. C.	Incineration of 17,400 cu yd TP soils and DNAPLs incineration off site removes a significant volume of potentially hazardous constituents from the site. Risk levels remain the same as D.	Comparable or same magnitude of risk as Alt. E remains for all media.
- Adequacy of Controls	Inadequate control for all media of conern.	Relatively adequate control against exposure; inadequate control as Alt. A. for GW.	Better control for all media achieved as compared to Alts. A and B.	Adequate control achieved as Alt. C for soils; DNAPLs' and GW controls are better than Alt. C. due to more aggressive pumping and treatment. treatment.	Control measures are comparable to Alt. D.	Achieves the same level of control as Alt. E

Table 7 Cont.

ALTERNATIVES ELEVATION CRITERIA	ALTERNATIVE - A NO ACTION	ALTERNATIVE - B INSTITUTIONAL CONTROL	ALTERNATIVE - C CONTAINMENT	ALTERNATIVE D TREATMENT AS PRINCIPAL METHOD	ALTERNATIVE E TREATMENT AS PRINCIPAL METHOD	ALTERNATIVE F TREATMENT AS PRINCIPAL METHOD
- Reliability of Controls	No control implemented.	Fencing and deed restriction provides for more reliable control as compared to Alt. A for all media except GW. GW control is the same as Alt. A.	Capping, gradient well extracation and slurry wall are all accepted methods of containment, and provide relatively higher levels of reliability as compared to Alt. A and B.	Same level of reliability as Alt. C for all media. DNAPLs' control is more reliable than Alt. C but technically difficult to achieve; case studies indicate complete recovery of DNAPLs is difficult.	Incineration of 17,400 cu yd of IP and TPH soil is a reliable method of control. DNAPL recovery has same limitations as in Alt. D.	Same level of reliability as Alt. E
3. Reduction of Toxicity, Mobility, and Volume						
- Treatment Process	No treatment process involved.	No treatment process involved.	Capping, gradient well extraction, and slurry wall are all established methods to reduce mobility of constituents; GW and DNAPL treatment processes are generally proven technologies.	GW and DNAPL treatment processes for this alternative is same as Alt. C; DNAPLs collection in large wells is promising technology. Water treatment methods vary but are established.	Treatment processes for Alt. E are the same as Alt. D except for IP soils. Incineration of affected soils is an effective and proven process.	All process options are the same as Alt. D and E except bio treatment is used as process option. Bio treatment has been shown to be effective for similarly affected soils, but will require verification design
- Amount of Hazardous Materials Remediated	No remediation involved	No remediation involved	Extraction and treatment of unspecified volume of GW; capping of 17,400 cu yd of affected IP & TPH soils; relocation of 7,700 cu yd of SS1 & SS2 soils and capping.	Same amount of affected soil remediated as Alt. C; in addition, 0.05 mil gal/yr of DNAPLs and 10 to 20 mil gal/yr of groundwater are extracted and treated.	Incineration and destruction of potentially hazardous constituents in 17,400 cu yd of IP & TPH soils; GW volumes remain the same as Alt. D. Stabilization of 7,700 cu yd of surface soils (SS1 and SS2).	Affected soils as in Alt. E are bio treated instead of incinerated. All other amounts remain the same as Alt. D and E.

Table 7 Cont.

ALTERNATIVES ELEVATION CRITERIA	ALTERNATIVE - A NO ACTION	ALTERNATIVE - B INSTITUTIONAL CONTROL	ALTERNATIVE C CONTAINMENT	ALTERNATIVE D TREATMENT AS PRINCIPAL METHOD	ALTERNATIVE E TREATMENT AS PRINCIPAL METHOD	ALTERNATIVE F TREATMENT AS PRINCIPAL METHOD
- Degree of Reduction	No reduction other than natural attentuation.	No reduction other than natural attentuation.	This alternative achieves significant reduction in mobility of all constituents, and achieves some reduction in and volume. Volume of constituents significantly reduced in GW in the long term - mobility of GW controlled during pumping. Capping of TP soils reduces mobility, but no volume or toxicity reduction except through GW control.	Total volume of constituents in GW significantly reduced in shorter period of time as compared to Alt. C. Better collectin and treatment of DNAPLs further reduces constituents in TZ groundwater. All other reductions remain the same as Alt. C.	Incineration and capping of 17,400 cu yd of TP & TPH soils achieves reduction in volume and mobility of constituents but resultant risks remain the same as Alt. D. Stabilization of surface soils achieves reduction in toxicity and mobility. All other reductions remain the same as Alt. D.	Bio treatment of 17,400 cu yd of TP soils achieves same level of reduction in mobility as Alt E, and slightly less volume of constituents than Alt. E. Other reductions remain the same as Alt. E.
4. Implementability						
- Technical Feasibility	No action implemented.	GW monitoring, fencing and deed restriction are easily implemented.	Slurry wall construction, capping, and gradient extraction wells are required. All are well established methods. Excavation and capping are also feasible techniques. Slurry wall compatibility with residual GW is likely adequate but will need further assessment during the design phase.	Technical requirements are the same as Alt. C, except the DNAPLs collection; Large diameter wells are techanically feasible, but little case history performance data is available to judge completness of DNAPL removal.	Incineration and stabilization are established practicies, and technically feasible. All other requirements are more or less same as Alt. C and D.	Bio treatment of 17,400 cu yd of soils is technically feasible but will require review of pilot studies to verify use at this site. Other technical requirements are well established and same as Alt. D.
- Administrative Feasibility	None required.	Coordination and permission of NL&P and SDHP for Coordination and permission	Coordination and permission of NL&P and SDHP for Coordination and permission; Also, contract for POTW service required	Coordination and permission of NL&P and SDHP for Coordination and permission; Also, permits and licenses for off site transportation	Coordination and permission of NL&P and SDHP for Coordination and permission; Additionally on site incinerator operation compliance with permit requirements may be necessary if Source Control incinerator has been removed Window of implementability is limited for Alt. E (must use existing incinerator before July 1991).	Coordination and permission of NL&P and SDHP for Coordination and permission; Additionally on site bio treatment operation compliance with permit requirements may be necessary permit requirements may be necessary.

Table 7 Cont.

ALTERNATIVES ELEVATION CRITERIA	ALTERNATIVE - A NO ACTION	ALTERNATIVE - B INSTITUTIONAL CONTROL	ALTERNATIVE C CONTAINMENT	ALTERNATIVE D TREATMENT AS PRINCIPAL METHOD	ALTERNATIVE E TREATMENT AS PRINCIPAL METHOD	ALTERNATIVE F TREATMENT AS PRINCIPAL METHOD
- Availability of Services and Materials	None required.	Fencing materials, GW sampling equipment and other services readily available.	Fencing materials, GW sampling equipment and other services readily available. Additionally, clay supply, pumps, holding tanks and flow regulators required are readily available.	Fencing materials, GW sampling equipment and other services readily available. Additionally, clay supply, pumps, holding tanks and flow regulators required are readily available.	Same as C; additionally, on site incinerator, power supply, and operational infrastructure all currently exist or available. Admixtures required for stabilization of surface soils are propriatary. Window of implementability for E-1 may be difficult to meet.	Same as C; additionally, on site bio reactors will be required; limited suppliers of bio reactors may impact costs, requirements for surface soils is same as E.
5. Cost						
- Capital Cost	None	Low capital cost compared to Alt. C thru F.	Low capital cost for GW and surface soils; medium capital cost for TP soil capping, additional wells in T2 containment.	Same as C, except additional capital cost for construction of additional injection and extraction wells.	Medium capital cost for GW, surface soils; medium to high capital cost for TP soil incineration. Relatively higher capital cost as compared to Alt. D. Alt. E-1 has low capital cost compared to E-2 (new mobile incinerator)	Same level of capital cost as Alt. E-2.
- O & M Cost	None	Very low O & M cost compared to alternatives C thru F.	Relatively more O & M cost as compared to Alt. B, although it is still low compared to Alt. D thru F.	Higher than Alt. C due to more wells.	High O & M cost for operation of incinerator. Significantly more than Alt. D. The cost and time associated with the reduction of volume and mobility of constituents are high relative to Alt. D, (especially for Alt. E-2).	High O & M costs for bio treatment but lower than Alt. E-2.
- Present Worth (30 year period of performance)	$0.08 million	$3.6 million	$8.2 million	$8.8 million	$13.5 million (E1) $20.5 million (E2)	$18.0 million

Table 7 Cont.

ALTERNATIVES ELEVATION CRITERIA	ALTERNATIVE - A NO ACTION	ALTERNATIVE - B INSTITUTIONAL CONTROL	ALTERNATIVE C CONTAINMENT	ALTERNATIVE D TREATMENT AS PRINCIPAL METHOD	ALTERNATIVE E TREATMENT AS PRINCIPAL METHOD	ALTERNATIVE F TREATMENT AS PRINCIPAL METHOD
6. Compliance with ARARs						
- ARAR Achievement at the End of Remediation	Does not meet ARARs	Does not meet ARARs.	Ultimately may meet target levels for GW. Meets ARARs and target levels for other media.	Meets ARARs for all media. Meets MCL target levels for UC within 5 years. Meets ARARs and target levels for soils at end of remediation in less than 1 year.	Same as D except meets ARARs and target levels for soils within 20 months.	Same as D except meets ARARs and target levels for soils in 20 to 30 months.
- Appropriateness of Wavier	Not justifiable;	Wavier not justivies although current impact is minimal and Alt. provides protection for future	Wavier not requied.	Wavier not required.	Wavier not required.	Wavier not required.
7. Overall Protection of Human Health and the Enviorpment	No control against well development in UC-3 outside [illegible] Activity Area. No reduction in toxicity, mobility, or volume achieved. Least preferred of all alternatives. Provides no community protection against exposure of affected media. Significantly higher levels of risk as compared to other media of conern. Inadequate overall protection of human health and environment. Environmental degradation may increase as constituents migrate off site. off-site.	Substantial improvement and protection as compared to Alt. A through fencing and deed restrictions. Residential development eliminated due to deed restrictions. However, deliberate trespassing still poses significant risk of exposure. Ingestion of UC-3 groundwater outside the [illegible] boundary still poses the same level of risk as Alt. A	Containment option is a substantial improvement over Alt. A and B. Containment of affected soils reduces excess cancer risks to less than E-06 overall protection of human health and environment - considerably improved as compared to Alt. A and B.	This alternative provides improvement over Alt. C by agressive GW and DNAPLs recovery and treatment. Overall protection is enchanced compared to Alt. C due to better control of migration of GW, and better recovery system of DNAPLs collection. Multiple extraction and intensive pumping of GW and treatment adds to the overall protection level. Risks from exposure to affected soils is the same as Alt. C.	Incineration and capping of 17,400 cu yd of IP & IPH soils provides reduction in volume of residual constituents; risks of exposure to affected soils remain the same as Alt. D. Stabilization of surface soils prior to relocation and capping results in further reduction of constituent migration. Air emissions generated during remediation pose additional risks to nearby residents and site workers and thereby reduce the overall level of protection when compared to Alt. D.	The same level of overall protection is achieved in this alternative as in Alt. E. Bio remediation of 17,400 cu yd is a reliable treatment process and nearly as effective as incineration and can be achieved for lower cost.

TABLE 8
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS FOR AIR PATHWAYS

MOTCO - MANAGEMENT OF MIGRATION

AIR PATHWAY

REQUIREMENT	**ARAR?**	**JUSTIFICATION**
1. **CONTAMINANT SPECIFIC**		Air pathway consists of air emissions derived from volatilization, if any, from contaminated soils at site, emissions from excavation procedures, and emissions from groundwater, DNAPLs or soils treatment (incineration, air stripping, etc.).
Federal		
National Ambient Air Quality Standards (NAAQS) 40 C.F.R. Part 50	See below for pollutants	The NAAQS specify the maximum concentration of a federally regulated air pollutant (i.e., SO_2, particulate matter (PM_{10}), NO_2, CO, ozone, and lead) in an area resulting from all sources of that pollutant. No new construction or modification of facility, structure or installation may emit an amount of any criteria pollutant that will interfere with the attainment or maintenance of a NAAQS (see 40 C.F.R. § 51.160). For the federal NAAQS standards, all measurements of air quality are corrected to a reference temperature of 25°C and to a reference pressure of 760mm Hg (1,013.2 millibars). 40 C.F.R. § 50.3.

POLLUTANT		**AVERAGING TIME**	NAAQS PRIMARY ug/m^3	NAAQS PRIMARY ppm	NAAQS SECONDARY ug/m^3	NAAQS SECONDARY ppm
Sulfur Dioxide (SO_2)	Yes					
§ 50.4(a)		Annual Arithmetic Mean	80	0.03	—	—
§ 50.4(b)		24-hour	365[a]	0.14[a]	—	—
§ 50.5		3-hour	—	—	1300[a]	0.5[a]
Particulate Matter Federal - PM_{10}	Yes					
§ 50.6(b)		Annual Arithmetic Mean	50	—	50	—
§ 50.6(a)		24-hour	150[a]	—	150[a]	—
Nitrogen Dioxide (NO_2) § 50.11	Yes	Annual Arithmetic Mean	100	0.053	100	0.053
Carbon Monoxide (CO)						
§ 50.8(a)(1)	Yes	8-hour	10,000[a]	9[a]	—	—
§ 50.8(a)(2)		1-hour	40,000[a]	35[a]	--	—
Ozone § 50.9	Yes	1-hour	235[a]	0.12[a]	235[a]	0.12[a]
Lead § 50.12	Yes	3-month	1.5	--	1.5	--

Note: [a] May not be exceeded more than once per year; all other NAAQS may never be exceeded.

Note: Sulfur Dioxide, Nitrogen Dioxide and Carbon Monoxide standards applicable only to incineration and not other forms of remedial actions.

National Emission Standards for Hazardous Air Pollutants (NESHAPs) 40 C.F.R. Part 61	See following entries	These provisions regulate the emissions of specified "hazardous air pollutants" [listed in 40 C.F.R. § 61.01(a)] that are emitted from particular sources or processes [listed in 40 C.F.R. Part 61].
Benzene Standards 40 C.F.R. Part 61 Subpart J	No	Specified equipment (pumps, compressors, pressure relief devices, sampling connections, systems, open-ended valves or lines, valves, flanges and other connectors, product accumulator vessels, and control devices or systems) which contains or contacts fluid (liquid or gas) that is at least 10% benzene by weight must comply with equipment performance standards at 40 C.F.R. § 61.240 et seq. This requirement is not an ARAR as no fluid containing 10% benzene by weight is present in the Management of Migration operable unit.
Vinyl Chloride Standards 40 C.F.R. Part 61 Subpart F	No	The national emission standards for vinyl chloride are applicable only to plants producing ethylene dichloride, vinyl chloride or polyvinyl chloride; therefore, Subpart F is not applicable. Generally provides limit of 10 ppm vinyl chloride emissions (3-hour average) from certain fugitive emissions sources and specified equipment. Not an ARAR as unlikely to have vinyl chloride emissions of this concentration.
Fugitive Emissions Source Standards 40 C.F.R. Part 61 Subpart V	No	Regulates specified equipment which are potential sources of fugitive emissions because they contain or contact fluid which is at least 10% by weight a volatile hazardous air pollutant ("VHAP"--including benzene and vinyl chloride). This requirement is not an ARAR as no fluid containing at least 10% by weight of a VHAP is present in the Management of Migration operable unit.
State		
Texas Air Control Board Regulations 31 Tex. Admin. Code § 101 et seq.		
Nuisance 31 T.A.C. § 101.4	Yes	Prohibits discharge of air contaminants from any source in such concentration and duration as may be injurious to or adversely affect human health or welfare, animal life, vegetation, or property, or as to interfere with the normal use and enjoyment of animal life, vegetation, or property.

Particulates - Net Ground Level 31 T.A.C. § 111.52	Yes	The net ground level concentration (downwind at the property boundary minus upwind measurements) of particulate emissions from any source must not exceed: (a) 100 ug/m^3 of air sampled, averaged over 5 consecutive hours (b) 200 ug/m^3 of air sampled, averaged over 3 consecutive hours (c) 400 ug/m^3 of air sampled, averaged over 1 hour Not applicable to certain steam generators subject to 31 T.A.C. § 111.53.
SO_2 Ground Level Concentration 31 T.A.C. § 112.7	Yes	Specifically pertains to Galveston County. SO_2 emissions from any source must not exceed a net ground level concentration (downwind at property boundary minus upwind) of 0.28 ppm averaged over any 30-minute period. Serves as an ARAR only to extent it applies to the incineration remedial alternative.
Hydrogen Sulfide 31 T.A.C. § 112.31 & § 112.32	No	Sets net ground level concentration limits for hydrogen sulfide. Not an ARAR since no hydrogen sulfide emissions are expected during or after remediation.
Sulfuric Acid 31 T.A.C. § 112.41	No	Sets net ground level concentration limits for sulfuric acid. Not an ARAR since no sulfuric acid emissions are expected during or after remediation.
Inorganic Flouride 31 T.A.C. § 113.3(a)(2) and (a)(3)	No	Sets atmospheric and net ground level concentration limits for inorganic fluoride (as HF). Not an ARAR since no HF emissions are expected during or after remediation.
Beryllium 31 T.A.C. § 113.3(b)	No	Sets atmospheric and net ground level concentration limits for beryllium. Not an ARAR since no beryllium emissions are expected during or after remediation.

Chromium (vi)	16	11	1100	50
Copper	$e^{(0.9422[\ln(\text{hardness})]-1.3844)}$	$e^{(0.8545[\ln(\text{hardness})]-1.386)}$	4.37	4.37
Lead	$e^{(1.273[\ln(\text{hardness})]-1.460)}$	$e^{(1.273[\ln(\text{hardness})]-4.705)}$	140	5.6
Mercury	2.4	.012	2.1	.025
Selenium	260	35	410	54

* Numerical standard not identified in 31 T.A.C. § 307.6(c)(2).

Notes:
(1) These numerical criteria are based on ambient water quality documents published by EPA. In promulgating 31 T.A.C. § 307.6(c)(2), the TWC has recalculated EPA criteria in accordance with procedures in the EPA guidance document entitled "Guidelines for Deriving Site-specific Water Quality Criteria") to eliminate the effects of toxicity data for aquatic organisms which are not known to occur in Texas. 31 T.A.C. § 307.6(c)(2).

(2) Numerical Acute Criteria apply to all surface water (except in small zones of initial dilution at discharge points). Numerical chronic criteria apply to surface water with designated or existing aquatic life uses (except inside mixing zones and below critical low-flow conditions.)

(3) Numerical acute criteria are applied as 24-hour averages. Numerical chronic criteria are applied as seven-day averages.

(4) Additional indicator chemical identified numerical criteria for toxics are included in the TBC table.

(5) Not ARAR to extent wastewater is discharged to POTW.

LC50 Toxicity Criteria 31 T.A.C. § 307.6(c)(10)	Yes	Concentrations of toxic materials for which no numerical criteria have been specified must not exceed values which are chronically toxic to representative, sensitive aquatic organisms, as determined from appropriate chronic toxicity data or calculated as 0.1 of the median lethal concentration (LC50) for nonpersistent toxics (i.e., readily degrades, half-life less than 96 hours), 0.05 of LC50 for nonbioaccumulative, persistent toxics, and 0.01 of LC50 for bioaccumulative toxics. These concentrations were used in evaluating the endangerment assessment for the Management of Migration unit. Not ARAR to extent wastewater discharged to POTW.

		Health based numbers for 1,2 Dichloroethane, 1,1 Dichloroethane, 1,1,2 Trichloroethane, Benzene, Bis (2-chloroethyl) ether, Naphthalene, Vinyl Chloride are identified in the Management of Migration "To Be Considered" table. These health based numbers are judged to be "to be considered" values since LC50 concentrations are subject to change within the scientific community. The same methodology used to establish these values will be utilized to establish LC50 values for any additional indicator chemicals which may be identified. Note: Toxicity limitations based upon LC50 values are not currently utilized by the Texas Water Commission in permitting or enforcement activities.
Site-Specific Uses and Criteria 31 T.A.C. § 307.7(b)((5)	Yes	Basic uses such as navigation, agricultural water supply and industrial water must be maintained and protected for all surface water in which these uses can be achieved. Not ARAR to extent wastewater is discharged to POTW.
Oyster Waters 31 T.A.C. § 307.7(b)(3)(B)(iii)	No	Oyster waters should be maintained so that concentrations of toxic materials do not cause edible species of clams, oysters and mussels to exceed accepted guidelines for the protection of public health, including the U.S. Food and Drug Administration action levels for molluscan shellfish. Applies only to West Bay and Lower Galveston Bay. Modelling shows no impact on these waters.
Intermittent Streams 31 T.A.C. § 307.4(j)	Yes	Existing uses of intermittent streams, including significant aquatic life uses created by perennial pools, must be maintained. Uses for intermittent streams may include such seasonal uses as contact and noncontact recreation, navigation, agricultural and industrial raw water supply, and aquatic life uses. Not ARAR to extent wastewater is discharged to POTW.
Designated Segment Criteria 31 T.A.C. § 307.10, Appendix A and § 307.7(b)(3)(B)(iii)	No	The following are standards pertaining to West Bay (Segment 2424) and Lower Galveston Bay (Segment 2439); modelling shows no impact on these waters from site. Dissolved Oxygen — Minimum 4.0 mg/l pH Range — 6.5 - 9.0 Temperature — Maximum 95° F Fecal Coliform — *Assumed Inapplicable

TABLE (Cont'd)

MOTCO - MANAGEMENT OF MIGRATION

		Shellfish Contamination	Maintain waters so that concentrations of toxics in edible clams, oysters, and mussels meet FDA Action Levels for molluscan shellfish.
2. ACTION SPECIFIC ARARS		Remedial alternatives include installation of treatment system and discharge off-site or discharge to POTW.	
Federal Clean Water Act			
National Pollutant Discharge Elimination System, Section 402	Yes	Serves as an ARAR to extent it contains substantive standards and a point source discharge of wastewater occurs. A permit is not required as no permit is required for discharges to water bodies in close proximity to the site which are necessary for the implementation of the remedy. ARAR Guidance p. 3-2.	
§ 122.41 Conditions Applicable to All Permits	Yes	Serves as an ARAR to extent it contains substantive standards and a point source discharge of wastewater occurs. Establishes requirements to ensure compliance with discharge permit including duty to properly operate and maintain facilities, monitoring and recordkeeping and notification of noncompliance.	
§ 122.44 Establishing Limitations	Yes		
40 C.F.R. § 125.3 Technology-Based Treatment Requirements in Permits	Yes	Serves as an ARAR to extent it contains substantive standards and a point source discharge of wastewater occurs. Describes how effluent limitations will be incorporated into permit.	
40 C.F.R. § 125.100 Best Management Practices	Yes	Serves as an ARAR to extent it contains substantive standards and a point source discharge of wastewater occurs. Sets out applicability of technology-based treatment requirements to certain discharges of pollutants. Section 125.3(c) establishes methods for determining technology-based limits when EPA promulgated limitations are not applicable.	
		Serves as an ARAR to extent it contains substantive standards and a point source discharge of wastewater occurs. Requires implementation of best management practices program to prevent release of toxic constituents.	
Federal Clean Water Act Direct Discharges to Oceans Section 403.	No	No point source discharge will occur into territorial seas, the contiguous zone or the oceans.	

TABLE (Cont'd)

MOTCO - MANAGEMENT OF MIGRATION

Effluent Limitation Guidelines 40 C.F.R. Part 400-471	Yes	Serves as an ARAR to the extent incorporated into 40 C.F.R. § 125.3(c) which establishes methods for determining technology based limits when EPA promulgated limitations are not applicable. Not an ARAR for discharge to a POTW.
Pretreatment Standards 40 C.F.R. § 403.5	Yes	Prohibits discharge to a POTW of pollutants that "pass-through" (exit the POTW in quantities or concentrations that violate the POTW's NPDES permit) or cause "interference" (inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal, thereby causing a violation of the POTW's NPDES permit). Also prohibits introduction into a POTW of: (1) pollutants which create a fire or explosion hazard, (2) pollutants which will cause corrosive structural damage, (3) solid or viscous pollutants that will obstruct flow, (4) pollutants discharged at a flow rate and/or concentration that will cause interference, and (5) heat that will inhibit biological activity (never over 104°F).
Texas Hazardous Metal Discharge Limits 31 T.A.C. § 319.22	Yes	Sets discharge limits for certain indicator chemicals: Copper (.5 mg/L / 1.0mg/L / 2.0 mg/L) (average, daily and grab respectively), Lead (.5 / 1.0 / 1.5) and Mercury (.005 / .005 / .01). Not ARAR to extent discharge is to POTW.
3. LOCATION SPECIFIC ARARs		
National Historic Preservation Act 16 U.S.C. § 470 *et seq*. 40 C.F.R. § 6.301(b) 36 C.F.R. Part 800	No	Site has no historic, architectural, archaeological or cultural value, and is not listed on or eligible for listing on National Register of Historic Places.
Archaeological and Historic Preservation Act 16 U.S.C. § 469 *et seq*. 40 C.F.R. § 6.301(c)	No	No scientific, prehistoric, historic or archaeological data at site.
Historic Sites Act 16 U.S.C. §461 *et seq*. 40 C.F.R. § 6.301(a)	No	No landmark on National Registry of Landmarks will be affected by proposed remedies.

TABLE (Cont'd)

MOTCO - MANAGEMENT OF MIGRATION

Fish and Wildlife Coordination Act 16 U.S.C. § 661 et seq. 16 U.S.C. § 742(a) 16 U.S.C. § 2901	No	If stream or water body to be impounded, diverted, deepened or otherwise controlled or modified, requires federal agencies proposing or authorizing such modifications to consult with U.S. Fish and Wildlife Service with view toward conservation of wildlife. This is an administrative rather than substantive requirement because it requires consultation with an agency [see pp. 1-11, 1-12 CERCLA Compliance With Other Laws Manual (Draft, August 8, 1988)]; therefore, not an ARAR.
Endangered Species Act 16 U.S.C. §§ 1531 et seq. 50 C.F.R. Part 200 50 C.F.R. Part 402	No	Statute requires that proposed actions minimize effects on endangered species. No endangered species or critical habitats exist on the site and none are anticipated to be adversely impacted by the site.
Clean Water Act Dredge or Fill Requirements (Section 404)	No	Requires permit for discharge of dredged or fill materials into waters of the U.S., including wetlands [See 33 C.F.R. § 328.3]. Surface water discharges to waters of the U.S. are not discharges of dredged or fill material. Therefore standards are not an ARAR. See Groundwater Pathway table discussion on location specific standards for soils/groundwater.
Rivers and Harbors Act of 1899 33 U.S.C. 403 Section 10 Permit 33 C.F.R. parts 320-330	No	Navigable waters (see 33 C.F.R. § 329.4) not present at site; even if present, nationwide permit available for CERCLA site activities. See 33 C.F.R. § 330.5(a)(20).
Executive Order on Protection of Wetlands Exec. Order No. 11,990 40 C.F.R. § 6.302(a) and Appendix A	No	Surface water remedial alternatives will not involve destruction of wetlands. See discussion contained in location specific standards for groundwater/soils.
Executive Order on Floodplain Management Exec. Order No. 11,988 40 C.F.R. § 6.302(b) and Appendix A	Yes	Requires EPA to assess proposed remedy to ensure designed to minimize potential harm to or within floodplain. Serves as an ARAR as site is within 100 year floodplain.

TABLE (Cont'd)

MOTCO - MANAGEMENT OF MIGRATION

Wilderness Act 16 U.S.C. § 1131 et seq. 50 C.F.R. § 351	No	Proposed remedies will not affect federally owned wilderness area.
National Wildlife Refuge System 16 U.S.C. § 668dd 50 C.F.R. Part 27	No	Proposed remedies will not affect national wildlife refuge.
Wild & Scenic Rivers Act 16 U.S.C. § 1271 et seq. 40 C.F.R. § 6.302(e)	No	Proposed remedies will not affect a scenic river.
Coastal Zone Management Act 16 U.S.C. § 1451; 40 C.F.R. § 6.302d	No	Requires federal agencies to coordinate with State Coastal Zone Management Plans. No Coastal Zone Management Plan exists in Texas.
Marine Protection Research and Sanctuaries Act 33 U.S.C. § 1401 (Title I) 40 C.F.R. Part 220 16 U.S.C. § 1431 (Title III)	No	Title I requires permit for dumping of wastes which have been transported from the U.S. or from outside the U.S. in U.S. ocean waters. Activities at site will not include dumping of wastes in ocean. Title III requires conservation and management of areas designated as national marine sanctuaries. No such sanctuary designated in or near the site.

TABLE 10
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS FOR GROUNDWATER PATHWAYS

MOTCO - MANAGEMENT OF MIGRATION

GROUNDWATER PATHWAY[1]

REQUIREMENT	ARAR?	JUSTIFICATION
1. CONTAMINANT SPECIFIC ARARS		
Primary Drinking Water Standards (MCL) Safe Drinking Water Act 40 C.F.R. Part 141	Yes	Federal standard not legally applicable in absence of current public drinking water supply system (see 40 C.F.R. § 141.2). No such system utilizes TZ, UC-1, 2 or 3 as drinking water. Not relevant and appropriate for TZ as TZ is Class III ground water. UC-1, 2 and 3 are potentially usable as drinking water supplies and, therefore, MCL's are relevant and appropriate.[2]
Secondary Drinking Water Standards Safe Drinking Water Act 40 C.F.R. Part 143	No	Not an ARAR as site is not contributing any contaminants to an existing public drinking water supply. Standards are aesthetic rather than health-based at low levels. See 40 C.F.R. § 143.1.
Maximum Contaminant Level Goals (MCLG) Safe Drinking Water Act 40 C.F.R. § 141.50	No	Not an ARAR as MCL's are considered by EPA to be fully protective of human health and environment as these standards fall within the acceptable risk range of 10^{-4} to 10^{-7} for carcinogens and apply to all persons utilizing public drinking water. See EPA Interim Guidance on Compliance with ARARs, 52 Fed. Reg. 32496, 32499, and EPA Draft Guidance entitled CERCLA Compliance with Other Laws Manual (Aug. 8, 1988) p.4-8.

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[1] Includes free phase liquids.

[2] MOTCO Respondents do not agree with the Agency that MCL's are "relevant and appropriate" cleanup standards for UC-1 and UC-2. These groundwater units are more properly classified as Class III groundwater because it is unlikely they will ever be used as drinking water sources due to low yields, high concentrations of naturally occurring total dissolved solids and chlorides and readily available alternative sources of surface water.

TABLE (Cont'd)

MOTCO - MANAGEMENT OF MIGRATION

GROUNDWATER PATHWAY[1]

Federal Ambient Water Quality Criteria	No	Not an ARAR for groundwater as based on ingestion of both water and aquatic organisms which do not exist in ground water (would overestimate true impact). See EPA Superfund Public Health Evaluation Manual, October 1986, p. 67 (repeating same point).
RCRA Groundwater Protection Standards (GWPS) 40 C.F.R. Part 264 Subpart F; 31 T.A.C. § 335.156-.166	No	Not an ARAR as no "regulated unit" (i.e., a unit which receives hazardous waste after July 26, 1982) present in management of migration operable unit, see 40 C.F.R. § 264.90(a)(2) and because site is long inactive; affected materials in management of migration operable unit do not exist in discrete waste management units and do not exhibit discrete waste management boundaries similar to regulated units. The alternate concentration limit (ACL) demonstration process may be considered during the feasibility study process for guidance in setting cleanup action levels.
RCRA Corrective Action for Solid Waste Management Units (SWMU) 40 C.F.R. § 264.101; 31 T.A.C. § 335.167	No	Not an ARAR as provides no standard other than "protection of human health and the environment" which is already required under CERCLA § 121.
Texas Department of Health Drinking Water Standards Maximum Allowable Levels 25 T.A.C. Chapter 337	No	Standard not an ARAR in absence of "public drinking water supply system" (have potential for at least 15 service connections or serve at least 25 people at least 60 days out of the year). No such system exists near site. In addition, not an ARAR as no more stringent than federal MCLs. See CERCLA § 121(d)(2)(A) which requires that, before any State standard may be either applicable or relevant and appropriate, it must first be more stringent than a Federal standard.
Texas Recommended Secondary Constituent Levels 25 T.A.C. § 337.14	No	Prohibits a "source of supply" which does not meet standards from being used by public water system constructed after July, 1977. Not an ARAR as no public drinking water supply currently uses groundwater and because site is not contributing contaminants to a public drinking water supply.
State and Federal Surface Water Quality Standards	Yes	Serves as an ARAR for discharge of ground water into surface water to extent surface water itself is subject to the standards. See table discussing Surface Water pathway ARARs.

TABLE (Cont'd)

MOTCO - MANAGEMENT OF MIGRATION

GROUNDWATER PATHWAY[1]

2. Action Specific		Note: Remedial actions may include: ground water monitoring; construction and operation of ground water barrier or removal system; treatment of ground water; discharge to POTW or to surface water. ARARs for ground water treatment system are also discussed in table for surface water pathway as such treatment may be conducted for surface water as well.
Subpart F; 31 T.A.C. §§ 335.156-.166 (Releases) Except § 264.101; 31 T.A.C. § 335.167 (SWMU)	No	Not an ARAR as no "regulated" units (those receiving hazardous wastes after July 26, 1982) exist at the site and because no discrete waste disposal unit exists or will exist in management of migration operable unit for ground water pathway.
40 C.F.R. § 264.101; 31 T.A.C. § 335.167 (Corrective Action for Solid Waste Management Units)	No	Not an ARAR as no solid waste management unit requiring a RCRA permit exists at site and because this provision provides no action specific level or standard of control for hazardous substances at site other than general performance standard of protecting human health and the environment which is already required under CERCLA § 121.
Subpart G; 31 T.A.C. § 335.152(a)(5) (Closure)	Yes	Serves as an ARAR to extent provides general closure performance standard [§ 264.111] and requires removal/ decontamination of all hazardous wastes [§ 264.114] for ground water treatment equipment [other than equipment which constitutes a wastewater treatment unit as defined in 40 C.F.R. § 260.10. (See 40 C.F.R. § 264.1(g)(6) (wastewater treatment unit exemption from RCRA Standards).]
Subpart G; 31 T.A.C. § 335.152(a)(5) (Postclosure)	No	Not an ARAR as ground water treatment system will be clean closed.
Subpart I; § 335.152(a)(7) (Containers)	Yes	Serves as an ARAR to extent provides standards for condition, compatibility, management, inspection, containment and closure; these standards are ARARs for containers holding decommissioning materials (i.e. personal protective clothing) and spent carbon filters; provided, however, that secondary containment standards are not an ARAR for containers used for storage of solids [40 C.F.R. § 264.175(c)] or utilized for short term duration only.

TABLE (Cont'd)

MOTCO - MANAGEMENT OF MIGRATION

GROUNDWATER PATHWAY[1]

Subpart J; § 335.152(a)(8) (Tanks)	Yes	Serves as an ARAR to extent supplies integrity, design, installation, secondary containment, operating, inspection, corrective action and closure standards; provided, however, that such standards are not ARARs for tanks part of "wastewater treatment unit" as such units are exempted from RCRA tank standards [§ 264.1(g)(6); 53 Fed. Reg. 34060]. In addition, secondary containment standards are not ARARs for non-wastewater treatment unit tanks used to store solids only or to tanks used for short duration only. See Draft ARAR Guidance at p. 1-68.
Subpart K; 31 T.A.C. §§ 335.152(a)(9), .168 and .169 (Surface Impoundments)	No	Pertains only to surface impoundments used to treat, store or dispose hazardous waste; ground water pathway does not involve surface impoundments; ground water treatment and disposal systems not anticipated to utilize surface impoundment.
Subpart L; 31 T.A.C. §§ 335.152(a)(10) and .170 (Waste Pile)	No	Pertains only to waste piles used for treatment or storage of hazardous wastes; ground water pathway does not involve waste piles and treatment system not anticipated to utilize waste piles.
Subpart M; 31 T.A.C. §§ 335.152(a)(11), .171 and .172 (Land Treatment)	No	Pertains only to land treatment units used for treatment or disposal of hazardous wastes; ground water treatment will not involve land treatment (i.e., spray irrigation).
Subpart N; 31 T.A.C. §§ 335.152(a)(12), .173-.176 (Landfill)	No	Pertains only to landfills used to dispose of hazardous waste; ground water pathway does not involve landfills.
Subpart O (Incinerator)	Yes	Ground water not anticipated to be treated in incinerator; free phase liquid, if incinerated, would be subject to ARARs for source control incinerator.
Subpart X (Miscellaneous Units)	No	Pertains only to "miscellaneous" units that treat, store or dispose hazardous wastes; ground water not to be treated, stored or disposed of in miscellaneous unit.

TABLE (Cont'd)

MOTCO - MANAGEMENT OF MIGRATION

GROUNDWATER PATHWAY[1]

40 C.F.R. Part 268 (Land Ban)	No	Not an ARAR as hazardous wastes will not be placed in land disposal units; discharge subject to Pretreatment or NPDES regulation is not form of land disposal [RCRA § 3004(k), 53 Fed. Reg. 31149].
40 C.F.R. Part 280; 31 T.A.C. Chapter 334 (Underground Storage Tanks)	No	Pertains only to underground storage tanks (§ 280.1); no such tanks present at site; storage of petroleum or hazardous substances in UST not anticipated during treatment.
OSHA Worker Protection 40 C.F.R. § 300.38	Yes	Serves as an ARAR to protect workers at site. [29 C.F.R. 1910.120; 51 Fed. Reg. 45654 (interim final); 54 Fed. Reg. 9294 (final rule, effective March 6, 1990)].
PCB Disposal 40 C.F.R. § 761.60	No	PCBs not detected in ground water.
3. Location Specific Groundwater and Soil Pathway Combined		Note: Remedial alternatives considered include: ground water monitoring; ground water recovery and in situ or surface treatment with off site discharge; capping and/or excavation and capping of soils; and treatment of soils (in situ, landfarming or bioreactor).
National Historic Preservation Act 16 U.S.C. § 470 *et seq.* 40 C.F.R. § 6.301(b) 36 C.F.R. Part 800	No	Site has no historic, architectural, archaeological or cultural value and is not listed or eligible for listing on National Register of Historic Places.
Archaeological and Historic Preservation Act 16 U.S.C. § 469 *et seq.* 40 C.F.R. § 6.301(c)	No	No scientific, prehistoric, historic or archaeologic data at site.
Historic Sites Act 16 U.S.C. § 461 *et seq.* 40 C.F.R. § 6.301(a)	No	No landmark on National Registry of Landmarks will be affected by proposed remedies.

TABLE (Cont'd)

MOTCO - MANAGEMENT OF MIGRATION

GROUNDWATER PATHWAY[1]

Fish and Wildlife Acts 16 U.S.C. § 661 et seq. 16 U.S.C. § 742a 16 U.S.C. § 2901	No	If stream or water body to be impounded, diverted, deepened or otherwise controlled or modified by remedy, requires federal agencies proposing or authorizing such modifications to consult with U.S. Fish and Wildlife Service with view toward conservation of wildlife. This is an administrative rather than a substantive requirement because it requires consultation with an agency [see. pp. 1-11, 1-12 CERCLA Compliance with Other Laws Manual (draft, August 8, 1988)]; therefore, does not serve as an ARAR.
Endangered Species Act 16 U.S.C. § 1531 et seq. 50 C.F.R. Parts 200, 402	No	Statute requires that proposed actions minimize effects on endangered species. No endangered species or critical habitats exist on the site and none are anticipated to be adversely impacted by the site.
Clean Water Act 33 U.S.C. § 1344 40 C.F.R. Parts 230, 231 33 C.F.R. Parts 320-330	Yes	Requires permit for discharge of dredged or fill material into waters of the United States including wetlands (see 33 C.F.R. § 328.3); capping of soils in drainage ditches may involve discharge of fill material; "nationwide permit" (permit by rule) available for structures, work and discharges for containment and cleanup of hazardous substances which are subject to NCP provided regional response team activated under NCP concurs with proposed containment, cleanup action. 33 C.F.R. § 330.5(a)(20).
Rivers & Harbors Act of 1899 33 U.S.C. § 403 33 C.F.R. Parts 320-330	No	Proposed remedy will not involve placing any structure or doing any work in or affecting navigable water.
Protection of Wetlands Executive Order No. 11,990 40 C.F.R. § 6.302(a) and Appendix A	Yes	Requires EPA to assess proposed remedy to ensure design minimizes potential harm to or within wetland; serves as an ARAR to extent remedial activity may occur within a wetland area.
Floodplain Management Executive Order No. 11,998 40 C.F.R. § 6.302(b) and Appendix A	Yes	Requires EPA to assess proposed remedy to ensure designed to minimize potential harm to or within floodplain.

TABLE (Cont'd)

MOTCO - MANAGEMENT OF MIGRATION

GROUNDWATER PATHWAY[1]

Wilderness Act 16 U.S.C. § 1131 et seq. 50 C.F.R. § 35.1	No	Proposed remedies will not affect federally owned wilderness area.
National Wildlife Refuge System 16 U.S.C. § 668 50 C.F.R. Part 27	No	Proposed remedies will not affect national wildlife refuge.
Wild & Scenic Rivers Act 16 U.S.C. § 1271 et seq. 40 C.F.R. § 6.302(e)	No	Proposed remedies will not affect a scenic river.
Coastal Zone Management Act 16 U.S.C. § 1451; 40 C.F.R. § 6.302(d)	No	Requires federal agencies to coordinate with State Coastal Zone Management Plans. No Coastal Zone Management Plan exists in Texas.
Marine Protection, Research and Sanctuaries Act 33 U.S.C. § 1401 (Title I) 40 C.F.R. Part 220 16 U.S.C. § 1431 (Title III)	No	Title I requires permit for dumping of wastes which have been transported from the U.S. or from outside the U.S. in U.S. ocean waters. Activities of site will not include dumping of wastes in ocean. Title III requires conservation and management of areas designated as national marine sanctuaries. No such sanctuary designated in or near the site.
40 C.F.R. § 264.18 (Location Standards)	Yes	Requires facilities located in 100 year floodplains to prevent washout from active portions of the facility. Standard serves as an ARAR for treatment units at site (i.e. incinerator, bioreactor air stripper, land farming unit). Surface water run on/run off control will be maintained for all other areas but such areas will not be protected from 100 year flood. Not an ARAR to extent requires new treatment storage or disposal units to be located greater than 200 feet away from a fault which has had displacement in Holocene time; no such faulting exists within the area.

MOTCO - MANAGEMENT OF MIGRATION

TABLE 11

APPLICABLE OR RELEVANT AND
APPROPRIATE REQUIREMENTS FOR SOILS PATHWAYS

SOILS PATHWAY

REQUIREMENT	ARAR?	JUSTIFICATION
1. CONTAMINANT SPECIFIC ARARS		Note: Soils pathway involves contaminated soils and trailer park spill residues located at site and any contaminated sediments located in drainage ditches. No contaminant specific ARARs have been identified for soils at site. Refer to "To Be Considered" Table for list of criteria, guidance and advisories which will be considered in arriving at soil cleanup levels.
2. ACTION SPECIFIC ARARS		Note: Possible remedial alternatives include no action, excavation, dredging, capping and treatment by solidification, bioremediation and incineration and on-site landfill.
RCRA Standards		
Subpart B; 31 T.A.C. § 335.152(a)(1) (General Facility Standards)	Yes	Serves as an ARAR to extent provides security (§ 264.14), inspection (§ 264.15), personnel training (§ 264.16) and ignitible, reactive, incompatible waste standards (§ 264.17). Location standards contained in Subpart B are addressed as groundwater/soil location specific ARARs in Groundwater Pathway table.
Subpart F; 31 T.A.C. §§ 335.156-.166 (Releases) [except § 264.101 and 31 T.A.C. § 335.167 (SWMU)]	No	Imposes general groundwater monitoring and protection requirements to detect and respond to releases in the upper aquifer from "regulated" units (those receiving hazardous wastes after July 26, 1982). Not an ARAR for currently contaminated areas as these areas already constitute release into groundwater which will be addressed by remedial alternatives chosen for groundwater pathway.
40 C.F.R. § 264.101; 31 T.A.C. § 335.167 (Corrective Action for Solid Waste Management Units)	No	Not an ARAR as provides no action specific standard other than "protection of human health and environment" which is already required under CERCLA § 121.

SOILS PATHWAY

Subpart G; 31 T.A.C. § 335.152(a)(5) (Closure)	Yes	Provides general closure performance standard [§ 264.111] and requires removal/ decontamination of all hazardous wastes [§ 264.114]; these standards serve as an ARAR to extent treatment equipment or other waste handling equipment is utilized at site.
Subpart G; 31 T.A.C. § 335.152(a)(5) (Postclosure)	Yes	Serves as an ARAR for capped soil areas to extent provides standards for maintaining cap.
Subpart I; 31 T.A.C. § 335.152(a)(7) (Containers)	Yes	Provides standards for condition, compatibility, management, inspection, containment and closure. Serves as an ARAR to extent affected materials are held in containers; provided however that secondary containment requirements are not relevant and appropriate to containers used for storage of solids [40 CFR § 264.175(c)] or to containers used for short duration only.
Subpart J; 31 T.A.C. § 335.152(a)(8) (Tanks)	Yes	Supplies integrity, design, installation, secondary containment, operating, inspection, corrective action and closure standards; these standards are ARARs for tanks used for soil biodegredation or land farming; provided however, that secondary containment requirements are not ARARs for tanks holding solids only or for tanks used for short duration. See Draft ARAR Guidance at p. 1-68.
Subpart K; 31 T.A.C. §§ 335.152(a)(9), .168 and .169 (Surface Impoundments)	No	No surface impoundments to be utilized during remedial action, so not an ARAR.
Subpart L; 31 T.A.C. §§ 335.152(a)(10) and .170 (Waste Pile)	No	Waste piles not to be used as remedial alternative.
Subpart M; 31 T.A.C. §§ 335.152(a)(11), .171 and .172 (Land Treatment)	Yes	Serves as an ARAR to extent landfarming used as alternative; provides design, operating, monitoring and closure requirements [§ 264.276].

SOILS PATHWAY

Subpart N; 31 T.A.C. §§ 335.152(a)(12), .173-.176 (Landfill)	Yes	Serves as an ARAR to extent new onsite landfill is constructed.
Subpart O (Incinerator)	Yes	Serves as an ARAR to extent affected materials are incinerated. See Air Pathway table for ARARs pertaining to incineration.
Subpart X (Miscellaneous Units)	No	No miscellaneous units will be utilized on site.
40 C.F.R. Part 268 (Land Ban)	No	Not an ARAR as no placement of hazardous wastes into land disposal units will occur during remediation.
40 C.F.R. Part 280; 31 T.A.C. Chapter 334 (Underground Storage Tanks)	No	No underground storage tanks present at site; storage of petroleum or hazardous substances in UST not anticipated during treatment.
40 C.F.R. § 761.60 (PCB Disposal)	No	Not an ARAR for soils as no PCB concentrations detected in management of migration operable unit soils.
OSHA Worker Protection 40 C.F.R. § 300.38	Yes	Serves as an ARAR to protect workers at site. [29 C.F.R. 1910.120; 51 Fed. Reg. 45654 (interim final); 54 Fed. Reg. 9294 (final rule, effective March 6, 1990)].
3. LOCATION SPECIFIC ARARS		Note: Due to the similarity of location specific ARARs for soils to those for groundwater, these ARARs are addressed in Table III (Groundwater Pathway).

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Table 12

MANAGEMENT OF MIGRATION - TO BE CONSIDERED CRITERIA, ADVISORIES AND GUIDANCE

The following table identifies those criteria, advisories and guidance which are not ARARs but which have been used, or may be used in the future, to provide useful information and recommended procedures for developing cleanup standards for the Motco Management of Migration operable unit. This list must be considered a tentative one to the extent it addresses criteria, advisories and guidance for implementing various remedial action technologies due to the early stage of remedial technology alternative development. The draft guidance document entitled "CERCLA Compliance With Other Laws" (August 1988) contemplates the need to supplement standards relating to remedial alternatives throughout the feasibility study process and this will be done as soon as these remedial alternatives are developed. To the extent specific concentration limits have been developed based on various criteria, advisories and guidance, these limits are identified in the table along with the basis utilized to make these determinations.

I. CHEMICAL SPECIFIC

A. CRITERIA, ADVISORIES AND GUIDANCE

- Health Effects Assessments (HEAs) and Proposed HEAs, ("Health Effects Assessment for (Specific Chemicals)," ECAO, USEPA, 1985).
- Reference Doses (RFDs), ("Verified Reference Doses of USEPA," ECAO-CIN-475, January 1986). See also Drinking Water Equivalent Levels (DWELs), a set of medium specific drinking water levels derived from RfDs. (See USEPA Health Advisories, Office of Drinking Water, March 31, 1987.)
- Carcinogen Potency Factors (CPFs) (e.g., Q1 Stars, Carcinogen Assessment Group (CAG) Values), (Table 11, "Health Assessment Document for Tetrachloroethylene (Perchloroethylene)," USEPA, OMEA/6008-82/0005F, July 1985).
- Public health criteria on which the decision to list pollutants as hazardous under Section 112 of the Clean Air Act was based.
- Guidelines for Groundwater Classification under the EPA Groundwater Protection Strategy.
- EPA Groundwater Protection Strategy (August 1984).

(CONT'D)

- Designation of a USDW (No. 7.1, October 1979).
- Elements of aquifer identification (No. 7.2, October 1979).
- OSHA health and safety standards that may be used to protect public health (non-workplace).
- Health Advisories, EPA Office of Water.
- EPA Water Quality Advisories, EPA Office of Water, Criteria and Standards Division.
- TWC Groundwater Protection Strategy (April 1988).

II. ACTION SPECIFIC

A. CRITERIA, ADVISORIES AND GUIDANCE

- EPA's' Design Guidelines
  - (1) Surface Impoundments
  - (2) Land Treatment Units
  - (3) Landfill Design - Linear Systems and Final Cover
- Permitting Guidance Manuals
  - (1) Permit Writer's Guidance Manual for Hazardous Waste Land Treatment, Storage and Disposal Facilities, Phase I; (February 15, 1985) EPA/530-SW-85-024
  - (2) Permit Writer's Guidance Manual for Subpart F. (October, 1983)
  - (3) Permit Applicant's Guidance Manual for the General Facility Standards. (October 15, 1983) EPA OSW 00-00-968
  - (4) Waste Analysis Plan Guidance Manual. (October 15, 1984) EPA/530-SW-84-012

2 OF 2

PB 90

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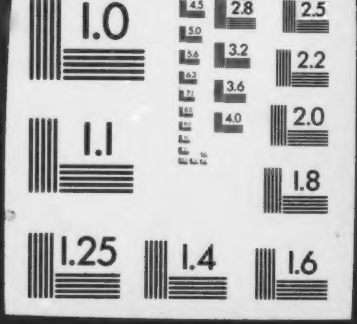
1.0
4.5
5.0
5.6
6.3
7.1
8.0
2.8
3.2
3.6
4.0
2.5
2.2
2.0
1.1
1.8
1.25
1.4
1.6

(5) Permit Writer's Guidance Manual for Hazardous Waste Tanks. (July 1983)

(6) Guidance Manual for Evaluating Permit Applications for the Operation of Hazardous Waste Incinerator Units. (July 1983)

- Technical Resource Documents (TRDs)

  (1) Draft Minimum Technology Guidelines on Double Liner System for Landfills and Surface Impoundments. (May 1985) PB 87151072-AS

  (2) Draft Minimum Technology Guidelines on Single Liner System for Landfills and Surface Impoundments. (May 1985) PB 87173159

  (3) Guide to the Disposal of Chemically Stabilized and Solidified Waste. (1982) EPA/530-SW-872

  (4) Hazardous Waste Land Treatment. (April 1983) OSW-00-00-874

  (5) Soil Properties, Classification, and Hydraulic Conductivity Testing. (March 1984) OSW-00-00-925, OSWER directive 9480.00.70

- Test Methods for Evaluating Solid Waste

  (1) Solid Waste Leaching Procedure Manual. (1984) OSW-00-00-924

  (2) Methods for the Prediction of Leachate Plume Migration and Mixing

(CONT'D)
CHEMICAL SPECIFIC
HEALTH BASED NUMBERS (HBNs)

CHEMICAL	HBN FOR POTABLE WATER	HBN FOR SURFACE WATER[(1)]
Benzene		700
Benzo(a)anthracene	0.0028[(2)]	ND
Benzo(a)pyrene	0.0028[(2)]	ND
Bis(2-Chloroethyl) Ether	0.3[(3)]	5,400
Chrysene	0.0028[(2)]	ND
Copper	1,000 [(4)]	-
1,2 Dichloroethane	-	6,500
1,1, Dichloroethene	-	10,800
Naphthalene	3,500 [(5)]	9.7
1,1,2 Trichloroethane	60 [(3)]	1,800

NOTES:

(1) Based on LC50 toxicity data; and calculated in conformance with 31 T.A.C. Section 307.6 (c) (10). Concentrations of toxic materials for which no numerical criteria have been specified must not exceed values which are chronically toxic to representative, sensitive aquatic organisms, as determined from appropriate chronic toxicity data or calculated as 0.1 of the median lethal concentration (LC50) for nonpersistent toxics (i.e., readily degrades, half-life less than 96 hours), 0.05 of LC50 for nonbioaccumulative, persistent toxics, and 0.01 of LC50 for bioaccumulative toxics.

(2) Total allowable for all PAHs

(3) Based on correlation between relative chemical potency and federal ambient water quality criteria (See EA, Appendix F)

(4) Secondary limit

(5) Based on toxicological data (See EA, Appendix F)

5. implement ground water compliance monitoring in the shallow Transmissive Zone Aquifer to the MOTCO property boundary. After treatment of this contaminated ground water zone below the established Feasability Study action levels (HBN's), compliance monitoring will begin. Should the levels of ground water contamination raise above the action levels, ground water removal and treatment will begin again;

6. implement ground water compliance monitoring in the Transmissive Zone Aquifer outside the property to monitor the movement of the existing offsite contaminant plume. Any movement in the plume will initiate more agressive ground water removal and treatment;

7. remove and treat the contaminated ground water identified in the Upper Chicot Aquifer Zone 3 to MCL's or appropriate concentrations to maintain 1x10-6 risk levels;

8. remove, to the extent feasible, dense organic liquids from the Transmissive Zone. Removed liquids will be incinerated either utilizing the existing Source Control facility or appropriate offsite facility;

9. remove and treat Transmissive Zone Aquifer ground water to the established Feasibility Study target levels (HBN's) and to prevent any further lateral migration to surface waters or ground water.

10. implement a groundwater gradient gradient control system to provide an upward gradient from the Upper Chicot Aquifer into the Transmissive Zone Aquifer;

11. recovered contaminated ground water shall be treated by the best available technology to the applicable, or relevant and appropriate State or Federal standard, or sent to a permitted wastewater treatment plant; and

12. excavation of surface soils and sediments in areas TPH, TP1, TP2, SS1, and SS2 to a maximum depth of four feet. Vertical and lateral extent of excavation shall be determined by a 1 x 10^{-6} risk level. Excavated material shall be placed in the TP1 area and capped with three feet of clay and one foot of top soil and seeded. The excavated areas shall be back-filled with clean material to original grade. Affected ditches shall be excavated until sampling shows background levels.

EPA has the enforcement authority to insure that no one interferes with the remedial action including land use and interference or damage to the final cap and ground water monitoring. If site conditions change, the changes will be evaluated and appropriate action taken.

Figure 12 illustrates the various components of the selected remedy.

MOTCO SITE
SUBSURFACE REMEDIATION PLAN

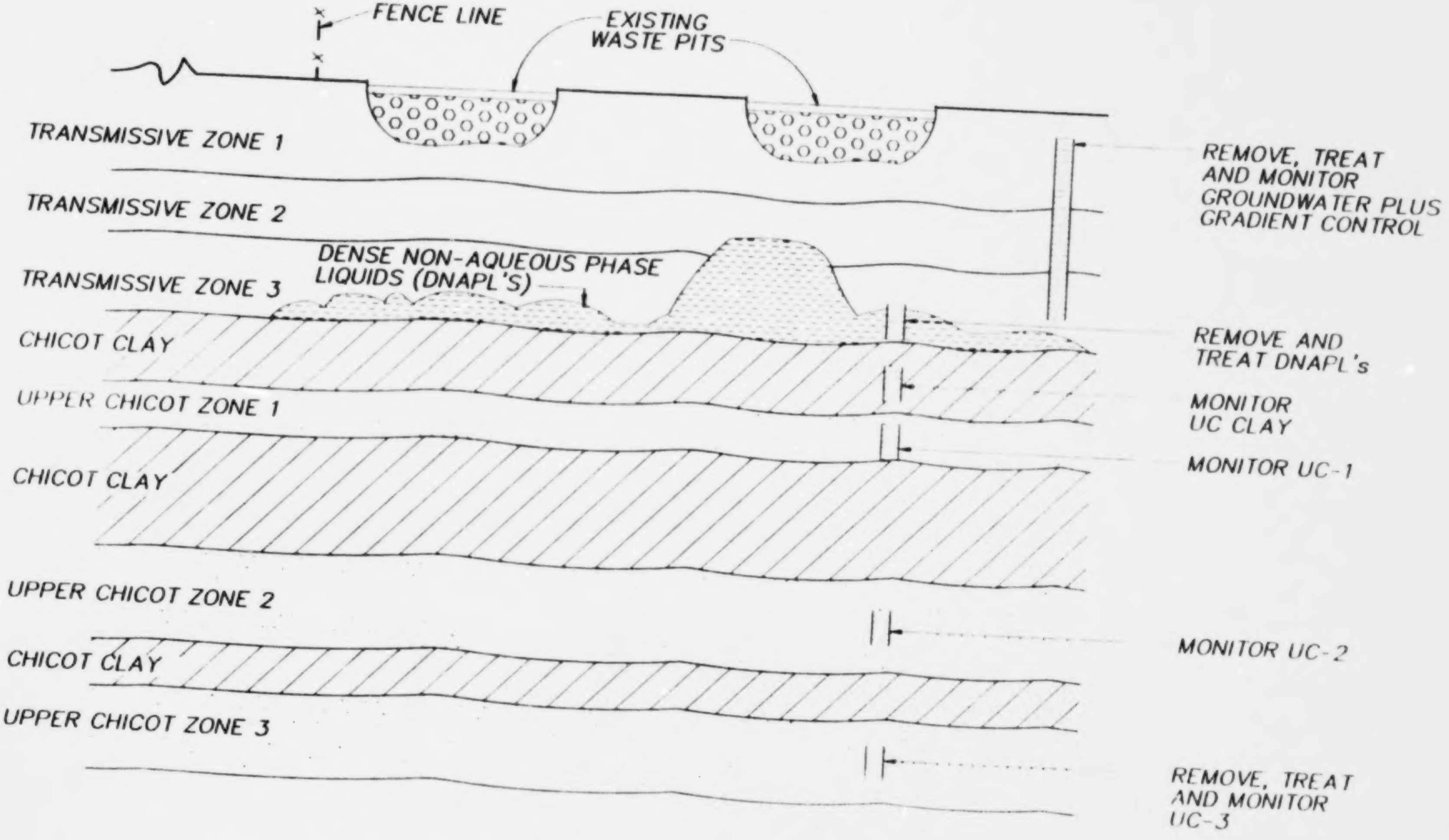
FENCE LINE
EXISTING WASTE PITS
TRANSMISSIVE ZONE 1
TRANSMISSIVE ZONE 2
DENSE NON-AQUEOUS PHASE LIQUIDS (DNAPL'S)
TRANSMISSIVE ZONE 3
CHICOT CLAY
UPPER CHICOT ZONE 1
CHICOT CLAY
UPPER CHICOT ZONE 2
CHICOT CLAY
UPPER CHICOT ZONE 3
REMOVE, TREAT AND MONITOR GROUNDWATER PLUS GRADIENT CONTROL
REMOVE AND TREAT DNAPL's
MONITOR UC CLAY
MONITOR UC-1
MONITOR UC-2
REMOVE, TREAT AND MONITOR UC-3

Figure 12

8.1 STATUTORY DETERMINATIONS

Under its legal authorities, EPA's primary responsibility at Superfund sites is to undertake remedial actions that achieve adequate protection of human health and the environment. In addition, section 121 of CERCLA establishes several other statutory requirements and preferences. These specify that when complete, the selected remedial action for this site

must comply with applicable or relevant and appropriate environmental standards established under Federal and State environmental laws unless a statutory waiver is justified. The selected remedy also must be cost effective and utilize permanent solutions and alternative treatment technologies or resource recovery tehcnologies to the maximum extent practicable. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as their principal element. The following section discusses how the selected remedy meets these statutory requirements.

8.2 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The selected remedy protects human health and the environment through recovery and treatment of the contaminated ground water and the dense, oily wastes in the shallow Transmissive Zone Aquifer; excavation, relocation, consolidation and capping of the shallow surface soils.

Estimates of total cancer risks from ingestion of ground water at well HW-1 is 3.3E-02 (without treatment). Treatment of ground water in the Upper Chicot Aquifer will be to MCL's or 1x10-6. Treatment of shallow Transmissive Zone ground water will be to HBN's.

The risk posed by the shallow offsite surface soils is 4.4E-5. Most of the risk is attributable to arsenic (3.3E-5). By excavating the hotspots of contaminated soils and capping them within the security fencing, the risk will be below the 4.4E-5, which is already within the 1E-4 to 1E-7 acceptable range. By capping the soils, the risks from exposure through direct contact will be further reduced. There are no short-term threats associated with the selected remedy that cannot be readily controlled. In addition, no adverse crossmedia impacts are expected from the remedy.

8.3 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The selected remedy of ground water treatment and soil consolidation will comply with all applicable or relevant and appropriate chemical-, action-, and location-specific requirements (ARAR's). The MOTCO MOM ARAR's are presented in Tables 8 through 12.

8.4 COST-EFFECTIVENESS

The selected remedy is cost-effective because it has been determined to provide overall effectiveness proportional to its costs, the net present worth value being $8,811,000 dollars. The estimated costs of the selected

remedy are within an order of magnitude of (less than 5 times) the costs associated with containment, yet the selected remedy assures a much higher degree of certainty that the remedy will be effective in the longterm due to the significant reduction of the toxicity and mobility of the wastes achieved through removal and treatment of the ground water and DNAPL's, and the capping of the soils to stabilize the metals. Incineration of the surface soils would cost between 13 and 20 million dollars, yet would only reduce the risk from 4.4E-5 to 3.3E-5.

8.5 UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES (OR RESOURCE RECOVERY TECHNOLOGIES) TO THE MAXIMUM EXTENT POSSIBLE

The EPA has determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner for the final management of migration operable unit at the MOTCO site. Of those alternatives that are protective of human health and the environment and comply with ARAR's, EPA has determined that this remedy provides the best balance of tradeoffs in terms of long-term effectiveness and permanence, reduction in toxicity, mobility, or volume achieved through treatment, short-term effectiveness, implementability, cost, while also considering the statutory preference for teatment as a principal element and considering State and community acceptance.

While the selected remedy does not offer as high a degree of longterm effectiveness and permanence as the soils incineration alternatives, it will significantly reduce the inherent hazards posed by the contaminated soils through excavation of the hotspots and capping and stabilizing the metals in the soils. Since the remaining material will be capped, the impact on human health and the environment will be minimal should the site security system fail. Additionally, the incineration option would also involve capping of the metal contaminated ash on site.

The selected remedy treats the principal threats posed by the ground water and the dense, oily organic wastes in the Transmissive Zone. The ground water treatment will be achieved within 5 years, while the DNAPL removal and treatment could take up to 30 years to complete. The removal and treatment of the dense organic liquids will reduce the threat of a constant source of contamination for the ground water.

In summary, the selected remedy achieves overall protection of human health and the environment and complies with the applicable or relevant and appropriate requirements, as well as providing the best balance between long-term effectiveness, reduction of toxicity, mobility and volume of waste, short-term effectiveness, implementability and cost. Therefore, it is deemed the most appropriate solution for the contaminated ground water, onsite subsurface, off-site surface and subsurface at the MOTCO Site.

8.6 PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

By recovering and treating the contaminated ground water in a water treatment facility and capping metal-contaminated soils, the selected remedy addresses one of the principal threats posed by the site through the use of treatment technologies. Therefore, the statutory preference for remedies that employ treatment as a principal element is satisfied.

APPENDIX A

MOTCO MANAGEMENT OF MIGRATION

ADMINISTRATIVE RECORD INDEX

Not included

APPENDIX B

MOTCO MANAGEMENT OF MIGRATION

STATE OF TEXAS CONCURRENCE

TEXAS WATER COMMISSION

B. J. Wynne, III, Chairman
Paul Hopkins, Commissioner
John O. Houchins, Commissioner

Allen Beinke, Executive Director
Michael E. Field, General Counsel
Brenda W. Foster, Chief Clerk

September 22, 1989

Allyn M. Davis, Ph.D., Director
Hazardous Waste Management Division
U. S. Environmental Protection Agency
Region VI
1445 Ross Avenue
Dallas, Texas 75202-2733

Re: MOTCO Management of Migration
Draft Record of Decision

Dear Dr. Davis:

We have reviewed the proposed Record of Decision (ROD) for the MOTCO site Management of Migration operable unit. We have no objection to the selected remedy as described in the draft ROD of September 1989. This selected remedy primarily consists of extraction and treatment of shallow and deep ground water; incineration of dense, non-aqueous phase liquids; and consolidation and on-site containment of contaminated surface soils and sediments.

Sincerely,

Dean Robbins

for Allen Beinke
Executive Director

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APPENDIX C

MOTCO MANAGEMENT OF MIGRATION

COMMUNITY RELATIONS RESPONSIVENESS SUMMARY

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Motco Management of Migration
Community Relations Responsiveness Summary

This Community Relations Responsiveness Summary has been prepared to provide written responses to comments submitted regarding the proposed plan of action for the Management of Migration (MOM) portion of the MOTCO hazardous waste site. The summary is divided into three sections:

Section I: Background of Community Involvement and Concerns. This section provides a brief history of community interest and concerns raised during the remedial planning activities at the Motco site.

Section II: Summary of Major Comments. The comments (both oral and written) are summarized and EPA's responses are provided.

Section III: Other Concerns. A brief summary and EPA's responses and/or disposition of other concerns related to the Motco site are provided.

I. Background of Community Involvement

Individual interest or attention to the MOTCO site is emotionally charged and organized. Several environmental groups have continually maintained a high level of interest and involvement in the MOTCO site. Local press coverage of the site has been extensive.

The majority of the community relations activities and outreach program are conducted by the Motco Trust Group with some EPA involvement. Frequent mailings, community leaders' meetings, site tours, and poster displays are the major elements of the outreach program. The majority of the concerns expressed over the years by the leaders and residents involve the incineration or source control portion of the site.

II. Summary of Major Comments

The Proposed Plan fact sheets announcing the public comment period and public meeting were distributed on July 28, 1989. The comment period began on August 7 and ended September 5, 1989. A public meeting was held on August 23 at the La Marque Volunteer Fire Department Hall. The purpose of the meeting was to explain the results of the remedial investigation and to outline the various alternatives presented in the feasibility study. Twenty-one people registered at the meeting and eight people asked questions or made statements. EPA also received three additional written comments.

A brief summary of the comments follow, along with EPA's responses:

Comment #1: There was insufficient notice of the meeting and comment period to the general public.

EPA Response: EPA believes that there was sufficient notice. The proposed plan fact sheet was individually mailed to 597 people. Additional copies were on display at the public libraries in La Marque, Texas City, Galveston and Houston; as well as the La Marque City Hall and the College of the Mainland. The fact sheet was mailed to the following media: KHTV, KCOH, KRIV, KILE, KTRK, KUHT, KPRC, KHOU, KGBC, UPI - Houston, Houston Post, Houston Chronicle, Texas City Sun, La Marque Times, The Daily Citizen, Pasadena Citizen, Galveston Daily News, Dickinson News and the League City News.

Comment #2: I have asked for an onsite visit and was told that EPA would have to grant permission.

EPA Response: Anyone entering the Motco contaminated area must comply with OSHA Hazardous Waste Safety Training. Therefore, before EPA will allow access to the site, you must present proof that the OSHA course has been completed.

Comment #3: I thought that the final action to be taken at the site was incineration of the wastes.

EPA Response: The MOTCO site was divided in 1986 into two operable units. The first operable unit, Source Control, will deal with the incineration of the wastes in the existing onsite lagoons. The second operable unit, Management of Migration (MOM) will deal with the affected ground water, off-site surface and subsurface contamination, and onsite affected subsurface. This Record of Decision (ROD) has chosen the remedy for the second operable unit. This ROD will be the final action taken at the MOTCO site.

Comment #4: Does the Endangerment Assessment (EA) include synergism, such as swimming and eating the dirt? Also does it take into account other daily activities, such as smoking?

EPA Response: No, it does not take into account the additional risk from cigarette smoking. However, the EA does look at additive effects and all reasonable pathways for human exposure to the site contaminants.

Comment #5: Does EPA plan on doing any health screenings around the MOTCO site?

EPA Response: No, the EPA feels that the Endangerment Assessment has adequately reviewed the risk associated with the MOTCO site and found no appreciable increase in health risks associated with the site remediation. The Agency for Toxic Substances and Disease Registry (ATSDR) concurred with the decision. However, citizens may petition ATSDR to conduct health assessments.

Comment #6: Does the MOM EA include risks from both Source Control and MOM?

EPA Response: No, this Risk Assessment reviews data for the MOM operable unit only.

The incinerator, to be used for Source Control activities, will have to operate under very rigid operating criteria that are both regulatory and health based. The incinerator will be monitored closely during the entire project.

Comment #7: Would the main difference between Alternatives F and D be on bioremediation or incineration of subsurface soils?

EPA Response: Yes, alternatives E and F deal with the surface soil remediation. In Alternative E, the surface soils would be incinerated. The surface soils would be bio-remediated in Alternative F.

Alternatives E and F were not selected due to the nature of the primary contaminant, metals. Alternatives E and F do not appreciably lower the risks for the additional costs necessary to implement the remedies.

Comment #8: What is Mixed-Funding? Does the taxpayer pay the government's share? Who determines the orphan share? Is MOM going Mixed Funding?

EPA Response: Mixed-Funding is a funding mechanism whereby the potentially responsible parties (PRP's) and the EPA share the costs of the selected remedy. This is only appropriate at sites where either a certain amount of the wastes cannot be directly linked with the known PRP's (the so called orphan's share) or when a known PRP is not willing to participate in the funding of the remedy. The EPA can later sue the recalcitrant PRP, and attempt to recover their share of the clean-up costs. At this time, it has not been determined whether the MOM Operable Unit will have mixed-funding.

Comment #9: Is the information, such as the charts at the Public Meeting, available in the repositories?

EPA Response: Yes, The charts displayed at the Public Meeting can be found in the MOTCO MOM Remedial Investigation (RI), Endangerment Assessment (EA), and Feasibility Study (FS). The Administrative Record for the MOTCO site is maintained at:

College of the Mainland, 810 Palmer Highway, Texas City, Texas.

In addition, the RI, EA, and FS are at nine locations.

Comment #10: Was the MOM Remedial Investigation and Feasibility Study (RI/FS) done by a contractor for EPA or was it done by the contractor for the MOTCO Trust Group?

EPA Response: It was done by contractors hired by the MOTCO Trust Group, with EPA and their contractors overseeing all activities.

Comment #11: Was there any data taken from the borrow pits?

EPA Response: Yes, based on water and sediment samples collected from the borrow pits as part of previous investigations in 1981 and 1984, it appears that the borrow pits have not been affected from the MOTCO site. However, the pits will be sampled again during the Remedial Design and Remedial Action activities to be conducted at the site.

Comment #12: The EPA has stated that approximately 20 acres are affected at the MOTCO site. Has this been checked by an independent source?

EPA Response: Yes, the RI/FS activities were conducted by the PRPs with EPA as an independent reveiwer.

Comment #13: Is the potential health and environmental risk discussed in the proposed plan before or after the soil has been remediated?

EPA Response: The potential risk discussed in the proposed plan is before any remediation occurs.

Comment #14: Does Alternative D include the components of Alternative B?

EPA Response: Yes.

Comment #15: Where are the site security fences located?

EPA Response: See attached figure.

Comment #16: Who is going to pay for the loss of much of the marsh?

EPA Response: The United States Department of the Interior (DOI) and and the National Oceanic and Atmospheric Administration (NOAA) are the trustees for natural resources in the nation.

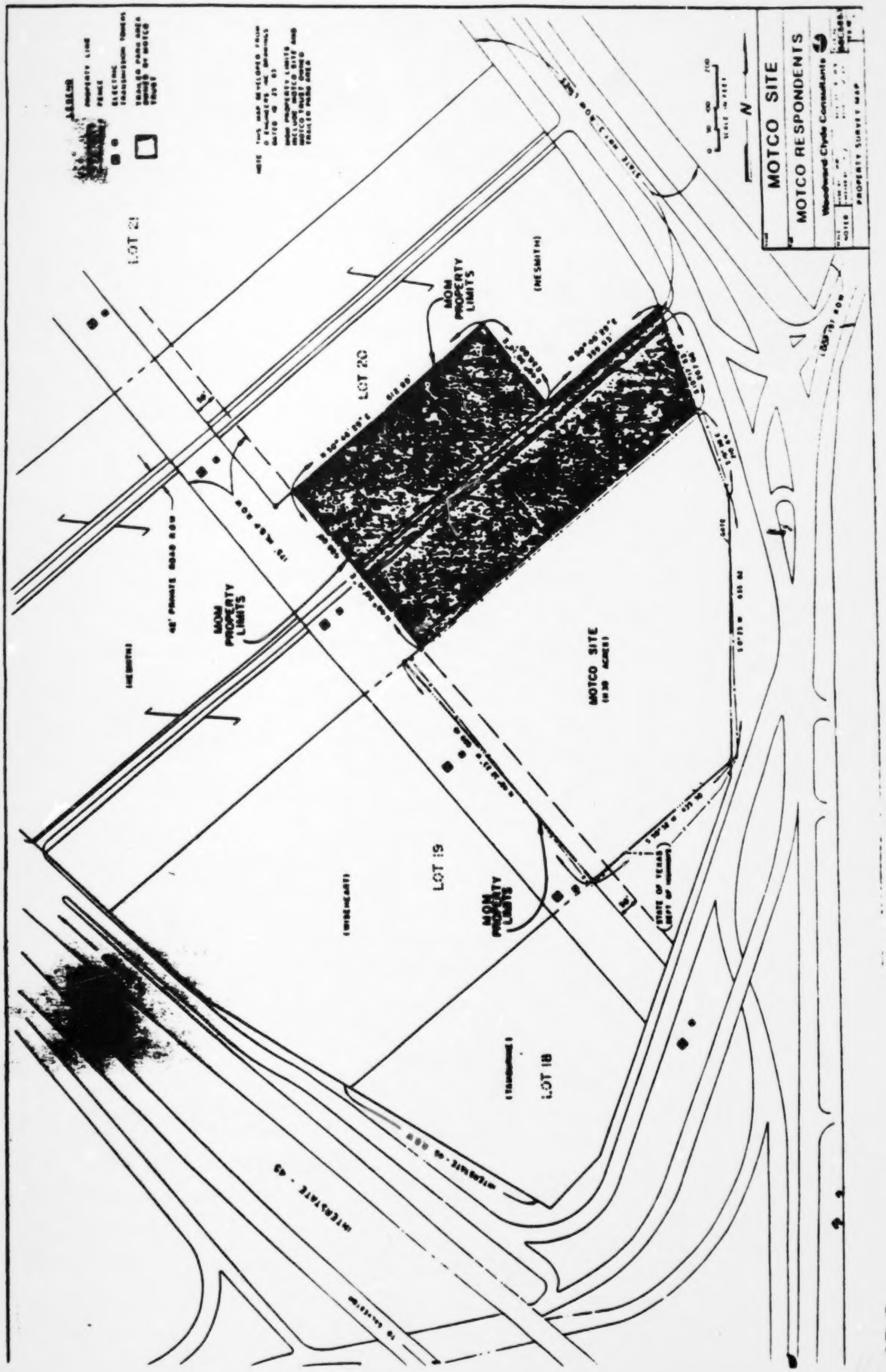
DOI, with support from U.S. Fish and Wildlife, worked out a mitigation plan with the MOTCO Trust Group to compensate for the twelve affected acres of the original MOTCO site. Under their plan, the MOTCO Trust Group will replace marshland habitat. There is currently a plan being worked out with the City of La Marque, Texas, for the establishment of a public park and wild life preserve to be established near the site. The MOTCO Trust Group will be paying for the costs associated with the wildlife preserve.

Comment #17: Are there cancer causing agents at MOTCO?

EPA Response: Yes, there are cancer causing agents at the MOTCO site. These chemicals were detected during the RI/FS process and were evaluated for potential health risks in the EA report (Chapters 4 and 5).

Comment #18: Does the EPA expect volatilization during excavation for MOM?

Figure 5


MOTCO SITE
MOTCO RESPONDENTS
Woodward-Clyde Consultants
PROPERTY SURVEY MAP
N
LEGEND
PROPERTY LINE
FENCE
LOT 21
LOT 20
LOT 19
LOT 18
(NESMITH)
MON PROPERTY LIMITS
40' PRIVATE ROAD R.O.W.
MOTCO SITE
STATE OF TEXAS
INTERSTATE - 45
TO GALVESTON

EPA Response: EPA shall be excavating only the top four feet of surface soil. The top four feet contains very low levels of volatile organic compounds. Therefore, EPA does not expect measurable emissions to be a problem during excavation and relocation. Air releases under Source Control were addressed during Source Control activities.

Comment #19: Was any damage to biota due to storm events or periodic overflows, such as Hurricane Alicia? Was there any assessment done on biota during Alicia?

EPA Response: A biota sampling workplan was reviewed and approved by NOAA prior to implementation. Subsequent sampling and analysis of biota did not appear to be affected at the MOTCO site. Details from the sampling and analysis results may be found in the EA, Chapters 8 and 9.

III. Other Concerns

Several other concerns were expressed regarding the MOTCO site but the concerns were outside the scope of the public comment period. These concerns are briefly summarized below:

Comment #1: Why is EPA hauling contaminated soil from the Geneva site and incinerating soils at the MOTCO site?

EPA Response: In the Geneva Record of Decision (ROD), EPA estimated the incineration costs to be $22 million and off-site land disposal to be $1[illegible] million. Incinerating the PCB contaminated soils at Geneva, at the time the ROD was signed, did not appreciably increase the level of protection to human health or the environment. The same amount of contaminated soils would have been shipped off-site for both alternatives. Therefore, incineration was not considered to be a cost effective remedy.

The MOTCO site remedy for the Source Control was selected after careful review and screening of several alternatives. Incineration was selected based, in part, on the characteristics of the wastes and the level of protection it affords for human health and the environment.

Comment #2: I have asked repeatedly that PRPs send out a plume model or the diagram disclosed at the PRP public meeting.

EPA Response: The plume model of particulate fallout disclosed by the MOTCO Trust Group, was not reviewed or approved by the EPA. It was a project planned by the Trust Group without any input from the Agency. Therefore, the Agency [illegible] not have a diagram of the model on file and has not requested a diagra[illegible]use it did not approve the project for the plume model.

Comment [illegible] Does International Technology (IT) have enough liability to cover any potential claim that might arise? Say long term problems that could cost $380 million or more. Or is EPA going to handle this out of taxpayer's money?

EPA Response: IT was selected as the contractor because they were the lowest responsible, responsive bidder. By law a contract has to be competitively bid and the low bidder given proper consideration. IT, however, along with the other bidding companies was screened for technical experience and financial capability to perform the work. Therefore IT was chosen because of their low bid and their capability to perform the work.

IT's liability is its contractual agreement with the MOTCO Trust Group. Therefore, the MOTCO Trust Group is responsible for making sure IT completes the Source Control project. The Agency is responsible for overseeing the MOTCO Source Control project to make sure that the work is conducted in accordance with the court ordered Consent Decree.

Under the mixed funding agreement, the Agency has committed to pay 21% of the Source Control Project not to exceed $9.324 million. The MOTCO Trust Group is responsible for 79% (or more) of the project costs.

Comment #4: Is the EPA familiar with the problems associated with the incinerator at the Marine Shale location in Louisiana?

EPA Response: Yes, Louisiana is one of the states under the jurisdiction of EPA, Region 6 (Dallas).

The MOTCO Incinerator operation will follow all of the federal laws and regulations appropriate under the Resource Conservation and Recovery Act (RCRA) and Toxic Substances Control Act (TSCA) that govern the technical criteria for which this incineration can operate, (such as temperature, automatic waste cut-offs, et cetera) with continuous monitoring.

Before any of the ash can be disposed of, it will have to be "delisted". This means the ash will be monitored for some 150 organic constituents and metals. Unless it passes the stringent low-level criteria, the ash will have to be put through the incinerator again. Should it contain inorganics (metals) above the delisting criteria, the ash will be stabilized before it can be disposed of and capped onsite.

Comment #5: Why is the MOTCO site considered to be the number one Superfund Site in Texas? Is it still considered to be #1?

EPA Response: The MOTCO site was assessed in 1980 for possible inclusion on the National Priorities List (NPL). This ranking package looked at types of wastes, pathways for exposure, how many people impacted, ground water, etc. Becaus[illegible] it's combined score of 62.5, it was placed on the NPL list in July of 19[illegible] is the highest ranking site in Texas to date.

Comment [illegible] Why is the #1 Superfund Site being incinerated in one of the most heavily populated areas of Galveston County?

EPA Response: The Source Control operable unit underwent an RI/FS. It was determined after careful review of all data generated, that incineration would be the most efficient known technology to deal with the types of waste at the Motco site.

Comment #7: How many chemicals are in MOTCO that there are no health criteria for?

EPA Response: There are a number of chemicals that the EPA has not currently established health criteria for. However, EPA has developed health critieria for chemicals that pose the greatest threat to human health and the environment. The risk assessment process identified 99% of the risk posed by the site contaminants. These identified compounds will be monitored during all remedial activities.

Comment #8: Have you talked to the waste handlers that have hauled waste to the MOTCO site?

EPA Response: Yes, during the Agency's attempts to obtain information about the parties responsible for placing the waste at the MOTCO site, several of the waste haulers were interviewed. The Agency has the testimony on record in the Dallas office.

Comment #9: How will the components that have no health criteria be monitored during incineration?

EPA Response: The incinerator will monitor for specific compounds of concern (most difficult to burn) and total VOCs. The incinerator must meet air emission requirements for the specific components and VOCs by combining specific emission controls that monitor onsite and at perimeter locations. The EPA believes that the remaining compounds will be sufficiently regulated.

Comment #10: Why were thief samples not taken in the MOTCO pits?

EPA Response: In response to the question about thief samples being performed on the MOTCO waste pits, the Agency as well as the MOTCO Trust Group performed adequate sampling on the waste pit contents. The resulting sampling data was used to identify the many chemicals placed in the MOTCO waste pits. The Agency does not believe that thief samples would have provided any more substantial data about the waste pits' contents.

Comment #11: Is Source Control air monitoring being conducted? What is being monitored? Is it continuous? Will it occur during Trial Burn? Will it include stack monitoring? What are acceptable risk levels for incineration? Will EPA use 30-day accumulated air samples? Will heavy metals be monitored during incineration?

EPA Response: During the incinerator construction activities air monitoring for particulate emissions and volatile organics (VOCs) was initiated. The air monitoring involves onsite sampling for VOCs in the work area and at the site perimeter (fence line), and particulate sampling at the site perimeter. The monitoring has been for VOCs such as vinyl chloride and benzene.

A more [illegible] monitoring program will be initiated during the Trial Burn because the incinerator must meet very stringent RCRA and TSCA performance standards for particulates (inorganics such as heavy metals) and VOCs. These performance standards require the incinerator to demonstrate that it can destroy a maximum of 99.9999% of the most toxic compounds. The heavy metals, however, will not be totally destroyed because they are not completely volatilized during incineration. The incinerator must continuously meet the stringent particulate (for inorganics such as lead) standard (≤ 180 milligrams per dry standard cubic foot) or not operate. The particulate compounds that do not completely volatilize must be in very low concentration (less than 1 ppm) before being stabilized in the ash. The ash will be placed in the clay lined pits and capped at mean sea level.

Comment #12: If the air monitors break down at MOTCO during incineration, will the incinerator shut down? How long is the shut down period?

EPA Response: If the continuous monitoring system for stack emissions malfunctions, there will be an automatic shutdown of the incinerator. The incinerator will remain in the shutdown mode until the problem is located and corrected.

Comment #13: How long will the turn around time be for air sampling results?

EPA Response: We are planning for a 24-hour turn around on the critical air sampling data. This is the data associated with perimeter and onsite air monitoring, and the sampling of the stack emissions.

Comment #14: What will happen during incineration when you hit a high pocket of contamination such as mercury?

EPA Response: The construction and operation of a waste feed preparation building will greatly minimize a problem with high pockets of contamination. Inside the building, waste feed analysis will be conducted on the wastes before incineration, to ensure that high concentrations of one type of waste are not inadvertently fed into the incinerator.

Comment #15: Will EPA use supplemental fuels during incineration?

EPA Response: Yes, the MOTCO incinerator will use supplemental fuels; however, to reduce operating costs suitable compounds found in the waste pits will be separated and blended with the supplemental fuel. This will be performed until those compounds are depleted. By blending the compounds with the supplemental fuels the chance of any health threatening toxics being emitted to the atmosphere is greatly minimized. The onsite and perimeter air monitoring will detect for VOC emissions generated by this mode of operation.

Comment #16: Why doesn't the EPA use biological testing to determine exposure concentration from the site during incineration?

EPA Response: Biological testing for the MOTCO site does not appear to be feasible. The Agency believes that incineration is proven technically and does not pose a threat to human health and the environment. The air monitoring provides a rapid and effective means of evaluating air quality during remediation.

Comment #17: What percentage of money for the clean up has been spent to date, and on what?

EPA Response: The MOTCO contractor, IT, has been paid approximately 33% of the contract amount. These funds have all been payment for the Source Control construction activities.

Comment #18: What is going to happen to the lead during incineration at the Motco site?

EPA Response: Lead is an element and therefore will not be destroyed by incineration. However, air monitoring will be used to ensure safe levels of particulate (lead and other heavy metals) air emissions. Any remaining concentrations of metals will be stabilized with the residual ash on site.

Comment #19: What is the ranking of the MOTCO site?

EPA Response: As of July 1989, the MOTCO site ranked 27th out of 1224 sites on the National Priorities List (proposed or final).

Comment #20: Can the citizen grant funds be used to develop data for a health registry? Are cancelled consultant fees considered as in-kind contributions?

EPA Response: The grant funds cannot be used to develop or create new data, only interpret existing data. Consultant fees for approved/eligible grant activities can be considered as in-kind services. In fact, any cost for service or goods that is eligible for reimbursement is also eligible for in-kind contributions.

Comment #21: Displays and models should be placed in the library to increase public awareness.

EPA Response: The requested displays and models are not EPA property. However, we have forwarded this request to the MOTCO Trust Group.

Comment #22: Can we replace existing signs at MOTCO stating it is an incineration project with time tables for incineration?

EPA Response: EPA feels that the MOTCO site is adequately designated as a hazardous waste site. The site perimeter fence displays several hazardous waste warning signs. The existing sign provides phone numbers for personal contact, should the public have specific questions concerning day-to-day site activities, such as incineration time tables.